

**PROJECT MANUAL**  
FOR CONSTRUCTION OF

# 2024 HVAC IMPROVEMENTS

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**MEDORA COMMUNITY SCHOOLS**  
Medora, Indiana



**TowerPinkster**

Architecture · Engineering · Interiors

**PROJECT MANUAL**  
FOR CONSTRUCTION OF

# 2024 HVAC IMPROVEMENTS

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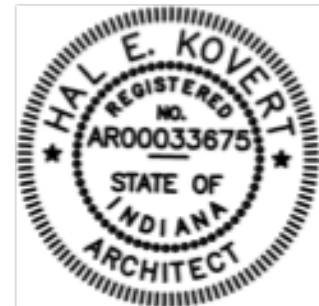
## MEDORA COMMUNITY SCHOOLS Medora, Indiana

**TowerPinkster**

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email: [hal.kovert@towerpinkster.com](mailto:hal.kovert@towerpinkster.com)

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A handwritten signature in black ink, appearing to read "H. Kovert", positioned above a horizontal line.

Hal E. Kovert, AIA  
State Registration Number AR00033675

Date: April 23, 2024  
File: 23-242-003

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SECTION 00 11 13 - NOTICE TO BIDDERS

Notice is hereby given that sealed proposals will be received:

BY: Medora Community School Corporation  
32 S. Perry Street  
Medora, Indiana 47260

FOR: 2024 HVAC Improvements  
Medora Community Schools  
82 S. George Johnson Road  
Medora, Indiana 47260

AT: Medora Community Schools  
Superintendent's Office  
32 S. Perry Street  
Medora, Indiana 47260

UNTIL: 11:00 a.m., (project local time)

DATE: Friday, May 10, 2024

At which time all proposals will be opened and publicly read aloud. Proposals received after the hour and date set for receiving of proposals, will be returned unopened.

All work will be awarded under a single General Contract.

Proposals shall be executed on the Contractor's Bid for Public Works, Form 96 (Revised 2013), Parts I and II, in full accordance with the Proposal Documents, which are on file with the Owner and Architect and may be examined by Bidders at the following locations:

Medora Community School Corporation  
32 S. Perry Street  
Medora, Indiana 47260

TowerPinkster  
320 Pearl Street, Suite 100  
New Albany, IN 47150

PRE-BID CONFERENCE

DATE: Monday, May 6, 2024  
TIME: 4:00 PM. Project Local Time  
LOCATION: Medora School – Media Center  
82 S George Johnson Road, Medora, IN 47260

All bidders and plan services will have free access to a complete electronic set of Drawings and Specifications. All bid documents may be downloaded free of charge in electronic PDF format for viewing, printing and distribution to bidders, sub-bidders, suppliers, and reprographics services at the discretion and responsibility of the General Contractors. Bidders shall complete the Plan Holder List form via [www.towerpinkster.com/bid-information](http://www.towerpinkster.com/bid-information). Upon completion of the form, bidders will be re-directed to the Project Page where all bid information may be downloaded. Bidders should bookmark this link and [www.towerpinkster.com/bid-information](http://www.towerpinkster.com/bid-information) for future access. A list of updated Plan Holders and Addenda will periodically be posted and made available for download.

The Architect retains all copyright to the bid documents, as instruments of their professional service. Bidders, or any other persons, may not use the PDF files for any other purpose than preparing a bid for this project.

All General Contractors planning to submit a bid for this project are required to be Registered Plan Holders. Registered Plan Holders are only those who complete the Plan Holder List form via the Architect's website as indicated above. Addenda and any other additional information will be emailed only to these registered plan holders (using the address provided on the Plan Holder List form) as they become available. Bidders obtaining partial copies of the bid documents from any other source are not Registered Plan Holders and will not be automatically provided with Addenda or other bidding updates as prepared by the Architect. Non-Registered Plan Holders assume all responsibility for obtaining all necessary information in a timely manner

General Contractors shall certify on the Proposal Form that they have obtained a complete set of construction documents, including all Drawings, Specifications and Addenda, and have reviewed the jobsite to sufficiently familiarize themselves with the existing conditions.

All questions and requests for substitutions shall be directed to:

**Hal E. Kovert, Project Architect**  
TowerPinkster  
hal.kovert@towerpinkster.com

Bid Security in the amount of five percent (5%) of the Proposal, including all add alternates must accompany each Proposal in accordance with the Instructions to Bidders.

The Owner reserves the right to accept or reject any bid and to waive any irregularities in bidding. The Base Bid may be held for a period not to exceed Forty-Five (45) days before awarding Contracts. All additive Alternate Bids may be held for a period not to exceed Thirty (30) days after signing of Contract.

Should a successful Bidder withdraw his bid, or fail to execute a satisfactory contract within ten (10) days after notice of acceptance of his bid, the Owner may declare the Bid Security forfeited as liquidated damages, not as penalty.

The successful Bidder shall furnish a Performance Bond and Labor and Materials Payment Bond in an amount equal to one hundred percent (100%) of the Contract Sum with an approved surety company and said bond shall remain in full force and effect for a period of one (1) year after date of final acceptance of the work. The cost of all bonds shall be included in the bid price.

Medora Community Schools  
April 23, 2024

END OF SECTION 00 11 13



# AIA<sup>®</sup> Document A701<sup>™</sup> – 2018

## Instructions to Bidders

for the following Project:  
(Name, location, and detailed description)

2024 HVAC Improvements  
Medora Community Schools  
82 S. George Johnson Road  
Medora, Indiana 47260

**THE OWNER:**  
(Name, legal status, address, and other information)

Medora Community School Corporation  
32 S. Perry Street  
Medora, Indiana 47260

**THE ARCHITECT:**  
(Name, legal status, address, and other information)

Tower Pinkster Titus Associates, Inc  
320 Pearl Street, Suite 100  
New Albany, IN 47150  
Telephone Number: 812.282.9554

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### ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

FEDERAL, STATE, AND LOCAL LAWS MAY IMPOSE REQUIREMENTS ON PUBLIC PROCUREMENT CONTRACTS. CONSULT LOCAL AUTHORITIES OR AN ATTORNEY TO VERIFY REQUIREMENTS APPLICABLE TO THIS PROCUREMENT BEFORE COMPLETING THIS FORM.

It is intended that AIA Document G612<sup>™</sup>-2017, Owner's Instructions to the Architect, Parts A and B will be completed prior to using this document.

## ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the Proposed Contract Documents. The Bidding Requirements consist of the advertisement or invitation to bid, Instructions to Bidders, supplementary instructions to bidders, the bid form, and any other bidding forms. The Proposed Contract Documents consist of the unexecuted form of Agreement between the Owner and Contractor and that Agreement's Exhibits, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, all Addenda, and all other documents enumerated in Article 8 of these Instructions.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, or in other Proposed Contract Documents apply to the Bidding Documents.

§ 1.3 Addenda are written or graphic instruments issued by the Architect, which, by additions, deletions, clarifications, or corrections, modify or interpret the Bidding Documents.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents, to which Work may be added or deleted by sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from, or that does not change, the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment, or labor for a portion of the Work.

## ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 By submitting a Bid, the Bidder represents that:

- .1 the Bidder has read and understands the Bidding Documents;
- .2 the Bidder understands how the Bidding Documents relate to other portions of the Project, if any, being bid concurrently or presently under construction;
- .3 the Bid complies with the Bidding Documents;
- .4 the Bidder has visited the site, become familiar with local conditions under which the Work is to be performed, and has correlated the Bidder's observations with the requirements of the Proposed Contract Documents;
- .5 the Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception; and
- .6 the Bidder has read and understands the provisions for liquidated damages, if any, set forth in the form of Agreement between the Owner and Contractor.

## ARTICLE 3 BIDDING DOCUMENTS

### § 3.1 Distribution

§ 3.1.1 Bidders shall obtain complete Bidding Documents, as indicated below, from the issuing office designated in the advertisement or invitation to bid, for the deposit sum, if any, stated therein.

*(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall obtain Bidding Documents.)*



**§ 3.1.2** Any required deposit shall be refunded to Bidders who submit a bona fide Bid and return the paper Bidding Documents in good condition within ten days after receipt of Bids. The cost to replace missing or damaged paper documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the paper Bidding Documents, and the Bidder's deposit will be refunded.

**§ 3.1.3** Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the advertisement or invitation to bid, or in supplementary instructions to bidders.

**§ 3.1.4** Bidders shall use complete Bidding Documents in preparing Bids. Neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete Bidding Documents.

**§ 3.1.5** The Bidding Documents will be available for the sole purpose of obtaining Bids on the Work. No license or grant of use is conferred by distribution of the Bidding Documents.

### **§ 3.2 Modification or Interpretation of Bidding Documents**

**§ 3.2.1** The Bidder shall carefully study the Bidding Documents, shall examine the site and local conditions, and shall notify the Architect of errors, inconsistencies, or ambiguities discovered and request clarification or interpretation pursuant to Section 3.2.2.

**§ 3.2.2** Requests for clarification or interpretation of the Bidding Documents shall be submitted by the Bidder in writing and shall be received by the Architect at least seven days prior to the date for receipt of Bids.  
*(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall submit requests for clarification and interpretation.)*

**§ 3.2.3** Modifications and interpretations of the Bidding Documents shall be made by Addendum. Modifications and interpretations of the Bidding Documents made in any other manner shall not be binding, and Bidders shall not rely upon them.

### **§ 3.3 Substitutions**

**§ 3.3.1** The materials, products, and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance, and quality to be met by any proposed substitution.

#### **§ 3.3.2 Substitution Process**

**§ 3.3.2.1** Written requests for substitutions shall be received by the Architect at least ten days prior to the date for receipt of Bids. Requests shall be submitted in the same manner as that established for submitting clarifications and interpretations in Section 3.2.2.

**§ 3.3.2.2** Bidders shall submit substitution requests on a Substitution Request Form if one is provided in the Bidding Documents.

**§ 3.3.2.3** If a Substitution Request Form is not provided, requests shall include (1) the name of the material or equipment specified in the Bidding Documents; (2) the reason for the requested substitution; (3) a complete description of the proposed substitution including the name of the material or equipment proposed as the substitute, performance and test data, and relevant drawings; and (4) any other information necessary for an evaluation. The request shall include a statement setting forth changes in other materials, equipment, or other portions of the Work, including changes in the work of other contracts or the impact on any Project Certifications (such as LEED), that will result from incorporation of the proposed substitution.

**§ 3.3.3** The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

**§ 3.3.4** If the Architect approves a proposed substitution prior to receipt of Bids, such approval shall be set forth in an Addendum. Approvals made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3.5 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

#### § 3.4 Addenda

§ 3.4.1 Addenda will be transmitted to Bidders known by the issuing office to have received complete Bidding Documents.

*(Indicate how, such as by email, website, host site/platform, paper copy, or other method Addenda will be transmitted.)*

§ 3.4.2 Addenda will be available where Bidding Documents are on file.

§ 3.4.3 Addenda will be issued no later than four days prior to the date for receipt of Bids, except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.4 Prior to submitting a Bid, each Bidder shall ascertain that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

### ARTICLE 4 BIDDING PROCEDURES

#### § 4.1 Preparation of Bids

§ 4.1.1 Bids shall be submitted on the forms included with or identified in the Bidding Documents.

§ 4.1.2 All blanks on the bid form shall be legibly executed. Paper bid forms shall be executed in a non-erasable medium.

§ 4.1.3 Sums shall be expressed in both words and numbers, unless noted otherwise on the bid form. In case of discrepancy, the amount entered in words shall govern.

§ 4.1.4 Edits to entries made on paper bid forms must be initialed by the signer of the Bid.

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter “No Change” or as required by the bid form.

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder’s refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall neither make additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name and legal status of the Bidder. As part of the documentation submitted with the Bid, the Bidder shall provide evidence of its legal authority to perform the Work in the jurisdiction where the Project is located. Each copy of the Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further name the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached, certifying the agent’s authority to bind the Bidder.

§ 4.1.8 A Bidder shall incur all costs associated with the preparation of its Bid.

#### § 4.2 Bid Security

§ 4.2.1 Each Bid shall be accompanied by the following bid security:

*(Insert the form and amount of bid security.)*

§ 4.2.2 The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and shall, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount

of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. In the event the Owner fails to comply with Section 6.2, the amount of the bid security shall not be forfeited to the Owner.

**§ 4.2.3** If a surety bond is required as bid security, it shall be written on AIA Document A310™, Bid Bond, unless otherwise provided in the Bidding Documents. The attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of an acceptable power of attorney. The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

**§ 4.2.4** The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until (a) the Contract has been executed and bonds, if required, have been furnished; (b) the specified time has elapsed so that Bids may be withdrawn; or (c) all Bids have been rejected. However, if no Contract has been awarded or a Bidder has not been notified of the acceptance of its Bid, a Bidder may, beginning days after the opening of Bids, withdraw its Bid and request the return of its bid security.

#### **§ 4.3 Submission of Bids**

**§ 4.3.1** A Bidder shall submit its Bid as indicated below:

*(Indicate how, such as by website, host site/platform, paper copy, or other method Bidders shall submit their Bid.)*

**§ 4.3.2** Paper copies of the Bid, the bid security, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address, and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

**§ 4.3.3** Bids shall be submitted by the date and time and at the place indicated in the invitation to bid. Bids submitted after the date and time for receipt of Bids, or at an incorrect place, will not be accepted.

**§ 4.3.4** The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

**§ 4.3.5** A Bid submitted by any method other than as provided in this Section 4.3 will not be accepted.

#### **§ 4.4 Modification or Withdrawal of Bid**

**§ 4.4.1** Prior to the date and time designated for receipt of Bids, a Bidder may submit a new Bid to replace a Bid previously submitted, or withdraw its Bid entirely, by notice to the party designated to receive the Bids. Such notice shall be received and duly recorded by the receiving party on or before the date and time set for receipt of Bids. The receiving party shall verify that replaced or withdrawn Bids are removed from the other submitted Bids and not considered. Notice of submission of a replacement Bid or withdrawal of a Bid shall be worded so as not to reveal the amount of the original Bid.

**§ 4.4.2** Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids in the same format as that established in Section 4.3, provided they fully conform with these Instructions to Bidders. Bid security shall be in an amount sufficient for the Bid as resubmitted.

**§ 4.4.3** After the date and time designated for receipt of Bids, a Bidder who discovers that it made a clerical error in its Bid shall notify the Architect of such error within two days, or pursuant to a timeframe specified by the law of the jurisdiction where the Project is located, requesting withdrawal of its Bid. Upon providing evidence of such error to the reasonable satisfaction of the Architect, the Bid shall be withdrawn and not resubmitted. If a Bid is withdrawn pursuant to this Section 4.4.3, the bid security will be attended to as follows:

*(State the terms and conditions, such as Bid rank, for returning or retaining the bid security.)*

## **ARTICLE 5 CONSIDERATION OF BIDS**

### **§ 5.1 Opening of Bids**

If stipulated in an advertisement or invitation to bid, or when otherwise required by law, Bids properly identified and received within the specified time limits will be publicly opened and read aloud. A summary of the Bids may be made available to Bidders.

### **§ 5.2 Rejection of Bids**

Unless otherwise prohibited by law, the Owner shall have the right to reject any or all Bids.

### **§ 5.3 Acceptance of Bid (Award)**

**§ 5.3.1** It is the intent of the Owner to award a Contract to the lowest responsive and responsible Bidder, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents. Unless otherwise prohibited by law, the Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's best interests.

**§ 5.3.2** Unless otherwise prohibited by law, the Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the lowest responsive and responsible Bidder on the basis of the sum of the Base Bid and Alternates accepted.

## **ARTICLE 6 POST-BID INFORMATION**

### **§ 6.1 Contractor's Qualification Statement**

Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request and within the timeframe specified by the Architect, a properly executed AIA Document A305™, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted for this Bid.

### **§ 6.2 Owner's Financial Capability**

A Bidder to whom award of a Contract is under consideration may request in writing, fourteen days prior to the expiration of the time for withdrawal of Bids, that the Owner furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. The Owner shall then furnish such reasonable evidence to the Bidder no later than seven days prior to the expiration of the time for withdrawal of Bids. Unless such reasonable evidence is furnished within the allotted time, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

### **§ 6.3 Submittals**

**§ 6.3.1** After notification of selection for the award of the Contract, the Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, submit in writing to the Owner through the Architect:

- .1 a designation of the Work to be performed with the Bidder's own forces;
- .2 names of the principal products and systems proposed for the Work and the manufacturers and suppliers of each; and
- .3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

**§ 6.3.2** The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

**§ 6.3.3** Prior to the execution of the Contract, the Architect will notify the Bidder if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, withdraw the Bid or submit an acceptable substitute person or entity. The Bidder may also submit any required adjustment in the Base Bid or Alternate Bid to account for the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

**§ 6.3.4** Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

## ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

### § 7.1 Bond Requirements

§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder.

§ 7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.

§ 7.1.3 The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 7.1.4 Unless otherwise indicated below, the Penal Sum of the Payment and Performance Bonds shall be the amount of the Contract Sum.

*(If Payment or Performance Bonds are to be in an amount other than 100% of the Contract Sum, indicate the dollar amount or percentage of the Contract Sum.)*

### § 7.2 Time of Delivery and Form of Bonds

§ 7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to commence sooner in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1.

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond.

§ 7.2.3 The bonds shall be dated on or after the date of the Contract.

§ 7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix to the bond a certified and current copy of the power of attorney.

## ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

§ 8.1 Copies of the proposed Contract Documents have been made available to the Bidder and consist of the following documents:

- .1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor, unless otherwise stated below.  
*(Insert the complete AIA Document number, including year, and Document title.)*
- .2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds, unless otherwise stated below.  
*(Insert the complete AIA Document number, including year, and Document title.)*
- .3 AIA Document A201™–2017, General Conditions of the Contract for Construction, unless otherwise stated below.  
*(Insert the complete AIA Document number, including year, and Document title.)*
- .4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:  
*(Insert the date of the E203-2013.)*

**.5 Drawings**

<b>Number</b>	<b>Title</b>	<b>Date</b>
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**.6 Specifications**

<b>Section</b>	<b>Title</b>	<b>Date</b>	<b>Pages</b>
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**.7 Addenda:**

<b>Number</b>	<b>Date</b>	<b>Pages</b>
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**.8 Other Exhibits:**

*(Check all boxes that apply and include appropriate information identifying the exhibit where required.)*

AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:  
*(Insert the date of the E204-2017.)*

The Sustainability Plan:

<b>Title</b>	<b>Date</b>	<b>Pages</b>
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Supplementary and other Conditions of the Contract:

<b>Document</b>	<b>Title</b>	<b>Date</b>	<b>Pages</b>
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**.9 Other documents listed below:**

*(List here any additional documents that are intended to form part of the Proposed Contract Documents.)*



SECTION 00 22 13 - SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

The following supplements modify the Instructions to Bidders, AIA Document A701 - 2018, entitled "Instructions to Bidders". Where a portion of the Instruction to Bidders is modified or deleted by these Supplementary Instructions, the unaltered portions of the Instructions To Bidders shall remain in effect.

ARTICLE 9 - SUPPLEMENTARY INSTRUCTIONS

- 9.1 Article 3 - BIDDING DOCUMENTS, delete the current Paragraph and replace with the following:  
3.1.1 All bid documents may be downloaded free of charge in PDF format for viewing, printing and distribution to bidders, sub-bidders and suppliers at the discretion and responsibility of the general contractors. All information is posted on a website identified in the Notice To Bidders or available by contacting the Architect. The Architect retains all copyright to all Bid Documents. Bidders may not use the Bid Documents for any purpose except preparing a bid for this project. Bidders may not distribute Bid Documents to Plan Room services, either electronic or hard copy, without the express written permission of the Architect. Printing of bid documents, including all costs associated therewith, is to be borne by the bidders.
- 9.2 Article 3 - BIDDING DOCUMENTS, delete the current Paragraph and replace with the following:  
3.1.2 Bid documents are available to sub-bidders in accordance with Paragraph 3.1.1.
- 9.3 Article 3 - BIDDING DOCUMENTS, add the following Paragraph:  
3.1.5 In the event of any discrepancy between electronic versions and any hard copy, printed versions of the files, the hard copy version on file at the Architect's office will govern.
- 9.4 Article 3 - BIDDING DOCUMENTS, add the following Paragraph:  
3.3.5 When specifications include a list of acceptable manufacturers, it is done for the express purpose of establishing a basis of durability, efficiency, configuration, maintain Owner's maintenance stock, and not for the purpose of limiting competition. These said names establish the products on which the bidder's proposal shall be based for that particular specification item. Proposed substitutions must be submitted in accordance with Specification Section 01 62 00 - Product Options and Substitutions.
- 9.5 Article 3 - BIDDING DOCUMENTS, delete Paragraph 3.4.3.
- 9.6 Bidder shall submit financial statement demonstrating financial capability to complete project, as required by the Proposal Form.
- 9.7 Bidder shall submit two (2) copies of all required Bidding Documents.
- 9.8 All bidders shall submit Contractor's Bid For Public Works-Form 96, Part I and Part II (Revised 2013), as required by the Proposal Form.
- 9.9 Bidders are required to include unit prices on added or deleted work as listed on the Contractor's Bid Form.
- 9.11 Article 7 – PERFORMANCE BOND AND PAYMENT BOND.  
Under Section 7.1.1, delete the words "If stipulated in the Bidding Documents, the" and substitute the word "The".  
Under Section 7.1.1, add the following sentence: "The costs for all Bonds must be included in the bid price."  
  
Delete Section 7.1.2 in its entirety.

2024 HVAC IMPROVEMENTS  
MEDORA COMMUNITY SCHOOLS

23242.003  
04/23/2024

9.12 Materials supplied for this project are exempt from Indiana State Sales Tax. Products purchased from sources outside the State of Indiana may require payment of sales tax to that particular jurisdiction. All costs for such tax will be the responsibility of the Contractor.

9.13 Electronic submissions of bids are NOT acceptable. This includes fax and e-mail.

END OF SECTION 00 22 13



SECTION 00 41 00 – CONTRACTOR’S BID FORM: PUBLIC WORKS

1.01 PROJECT MANUAL

A. All requirements of the Project Manual shall apply to this Section.

1.02 SCOPE

A. Contractor’s Bid Form shall be Contractor’s Bid For Public Works-Form 96 (Revised 2013), as modified and as included in Section 00 42 01 and Section 00 42 02.

1. Part I of Form 96 must be completed as required by statutes.
2. Part II of Form 96 must be completed as required by statutes only if project is one hundred thousand dollars (\$100,000) or more (IC 36-1-12-4).
3. Proposal form shall be submitted in duplicate (one signed original and one copy).
4. Forms to be reproductions of those included in Project Manual.
5. Contractor may bid each, any, or all separate contracts listed.

B. The executed Proposal Form and Non-Collusion Affidavit will become a part of the successful Bidder’s Contract Documents.

END OF SECTION 00 41 00

PROPOSAL FORM: PART I  
Form 96 (Revised 2013)

**CONTRACTOR'S BID FOR PUBLIC WORKS**  
Prescribed by the State Board of Accounts

CONTRACTORS BID FOR: **2024 HVAC Improvements  
Medora Community Schools**  
82 S. George Johnson Road  
Medora, Indiana 47260

PART I  
**(Part I to be completed for all bids)**

Date (Month, Day, Year): \_\_\_\_\_

Governmental Unit (Owner): **MEDORA COMMUNITY SCHOOLS**

County: \_\_\_\_\_

Bidder (Firm): \_\_\_\_\_

Address: \_\_\_\_\_

City, State, Zip: \_\_\_\_\_

Telephone No.: \_\_\_\_\_

Fax No.: \_\_\_\_\_

E-Mail Address: \_\_\_\_\_

Agent of Bidder: \_\_\_\_\_  
(if applicable)

Pursuant to notices given, the undersigned offers to furnish labor and/or material necessary to complete the public works project of **MEDORA COMMUNITY SCHOOLS** (Governmental Unit) in accordance with plans and specifications prepared by TowerPinkster and their consultants for the sum of:

BASE BID

Lump Sum \_\_\_\_\_ \$ \_\_\_\_\_

The undersigned further agrees to furnish a bond or certified check with this bid for an amount specified in the notice of the letting. If alternative bids apply, the undersigned submits a proposal for each in accordance with the notice.

ADDENDA

Acknowledges receipt of:

Addendum No. \_\_\_\_\_ ( ) pages Dated \_\_\_\_\_

Addendum No. \_\_\_\_\_ ( ) pages Dated \_\_\_\_\_

Addendum No. \_\_\_\_\_ ( ) pages Dated \_\_\_\_\_

Addendum No. \_\_\_\_\_ ( ) pages Dated \_\_\_\_\_

ALLOWANCES

By initialing adjacent to amounts below, bidder acknowledges allowance amounts are included in the forgoing bid:

**Contingency Allowance** within the **Base Bid** per Section 01 21 13 **\$ 100,000** initials \_\_\_\_\_

COMPLETION OF WORK

Undersigned guarantees, if awarded contract on May 13, 2024 to achieve Substantial Completion of work by August 1, 2024.

DISCRIMINATION

The Contractor and his subcontractors, if any, shall not discriminate against or intimidate any employee, or applicant for employment, to be employed in the performance of this contract, with respect to any matter directly or indirectly related to employment because of race, religion, color, sex, national origin or ancestry. Breach of this covenant may be regarded as a material breach of the Contract.

CERTIFICATION OF USE OF UNITED STATES STEEL PRODUCTS (if applicable)

I, the undersigned bidder or agent as a contractor on a public works project, understand my statutory obligation to use steel products made in the United States (I.C. 5-16-8-2). I hereby certify that I and all subcontractors employed by me for this project will use U.S. steel products on this project if awarded. I understand that violations hereunder may result in forfeiture of contractual payments.

NON-COLLUSION AFFIDAVIT

The undersigned bidder or agent, being duly sworn on oath, says that he has not, nor has any other member, representative, or agent of the firm, company, corporation or partnership represented by him, entered into any combination, collusion or agreement with any person relative to the price to be bid by anyone at such letting nor to prevent any person from bidding nor to induce anyone to refrain from bidding, and that this bid is made without reference to any other bid and without any agreement, understanding or combination with any other person in reference to such bidding.

He further says that no person or persons, firms, or corporation has, have or will receive directly or indirectly, any rebate, fee, gift, commission or thing of value on account of such sale.

GENERAL CONTRACTOR CERTIFICATION

I hereby certify that we have obtained a complete set of construction documents, including all Drawings, Specifications and Addenda, and have reviewed the jobsite to sufficiently familiarize ourselves with the existing conditions.

Dated at \_\_\_\_\_ this \_\_\_\_\_ day of \_\_\_\_\_, 2024.

\_\_\_\_\_  
(Name of Organization)

BY \_\_\_\_\_

\_\_\_\_\_  
(Title of Person Signing)

OATH AND AFFIRMATION

I hereby affirm under the penalties for perjury that the facts and information contained in the foregoing bid for public works are true and correct.

Dated at \_\_\_\_\_ this \_\_\_\_\_ day of \_\_\_\_\_, 2024.

\_\_\_\_\_  
(Name of Organization)

BY \_\_\_\_\_

\_\_\_\_\_  
(Title of Person Signing)

ACKNOWLEDGEMENT

STATE OF \_\_\_\_\_

COUNTY OF \_\_\_\_\_

Before me, a Notary Public, personally appeared the above-named \_\_\_\_\_ and  
(Name of Person Signing)  
swore that the statements contained in the foregoing document are true and correct.

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, 2024.

\_\_\_\_\_  
Notary Public

My Commission Expires: \_\_\_\_\_

County of Residence: \_\_\_\_\_

ACCEPTANCE

The above bid is accepted this \_\_\_\_\_ day of \_\_\_\_\_, 2024

subject to the following conditions: \_\_\_\_\_  
\_\_\_\_\_.

Contracting Authority Members:

_____	_____
_____	_____
_____	_____

END OF SECTION 00 42 01

PROPOSAL FORM: PART II  
Form 96 (Revised 2013)

**CONTRACTOR'S BID FOR PUBLIC WORKS**  
Prescribed by the State Board of Accounts

Part II

**(Part II to be completed only if project is \$100,000 or more - IC 36-1-12-4).**

Governmental Unit: **MEDORA COMMUNITY SCHOOLS**

Bidder (Firm): \_\_\_\_\_

Date: \_\_\_\_\_

These statements to be submitted under oath by each bidder with and as a part of his bid.  
Attach additional pages for each section as needed.

SECTION I: EXPERIENCE QUESTIONNAIRE

1. What public works projects has your organization completed for the period of one (1) year prior to the date of the current bid?

<i>Contract Amount</i>	<i>Class of Work</i>	<i>Completion Date</i>	<i>Name and Address of Owner</i>
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\_\_\_\_\_  
\_\_\_\_\_

2. What public works projects are now in process of construction by your organization?

<i>Contract Amount</i>	<i>Class of Work</i>	<i>Expected Completion Date</i>	<i>Name and Address of Owner</i>
------------------------	----------------------	---------------------------------	----------------------------------

\_\_\_\_\_  
\_\_\_\_\_

3. Have you ever failed to complete any work awarded to you? \_\_\_\_\_ If so, where and why?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

4. List references from private firms for which you have performed work.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

SECTION II: PLAN AND EQUIPMENT QUESTIONNAIRE

1. Explain your plan or layout for performing proposed work.

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2. Please list the names and addresses of all subcontractors that you have used on public works projects during the past five (5) years along with a brief description of the work done by each subcontractor.

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3. If you intend to sublet any portion of the work, state the name and address of each subcontractor, equipment to be used by the subcontractor, and whether you will require a bond. However, if you are unable to currently provide a listing, please understand a listing must be provided prior to contract approval. Until the completion of the proposed project, you are under a continuing obligation to immediately notify the governmental unit in the event that you subsequently determine that you will use a subcontractor on the proposed project.

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4. What equipment do you have available to use for the proposed project? Any equipment to be used by subcontractors may also be required to be listed by the governmental unit.

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5. Have you entered into contracts or received offers for all materials which substantiate the prices used in preparing your proposal? If not, please explain the rationale used which would corroborate the prices listed.

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SECTION III: CONTRACTOR'S FINANCIAL STATEMENT

Attachment of bidder's financial statement is mandatory. Any bid submitted without said financial statement as required by statute shall thereby be rendered invalid. The financial statement provided hereunder to the governing body awarding the contract must be specific enough in detail so that said governing body can make a proper determination of the bidder's capability for completing the project if awarded.

SECTION IV: NON-COLLUSION AFFIDAVIT

The undersigned bidder or agent, being duly sworn on oath, says that he has not, nor has any other member, representative, or agent of the firm, company, corporation or partnership represented by him, entered into any combination, collusion or agreement with any person relative to the price to be bid by anyone at such letting nor to prevent any person from bidding nor to induce anyone to refrain from bidding, and that this bid is made without reference to any other bid and without any agreement, understanding or combination with any other person in reference to such bidding.

He further says that no person or persons, firms, or corporation has, have or will receive directly or indirectly, any rebate, fee, gift, commission or thing of value on account of such sale.

SECTION V: OATH AND AFFIRMATION

I hereby affirm under the penalties for perjury that the facts and information contained in the foregoing bid for public works are true and correct.

Dated at \_\_\_\_\_ this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
(Name of Organization)

BY \_\_\_\_\_

\_\_\_\_\_  
(Title of Person Signing)



ACKNOWLEDGEMENT

STATE OF \_\_\_\_\_

COUNTY OF \_\_\_\_\_

Before me, a Notary Public, personally appeared the above-named \_\_\_\_\_ and  
*(Name of Person Signing)*  
swore that the statements contained in the foregoing document are true and correct.

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, 20 \_\_\_\_.

\_\_\_\_\_  
*Notary Public*

My Commission Expires: \_\_\_\_\_

County of Residence: \_\_\_\_\_

END OF SECTION 00 42 02

SECTION 00 43 13 - BID SECURITY FORM

1.01 PROJECT MANUAL

All requirements of the Project Manual shall apply to this Section.

1.02 SCOPE

A. Contractors Bid Security shall be either:

1. Bid Bond.
2. Certified Check.
3. Cashier's Check.

B. The Bid Bond, if used, shall be AIA Document A310 - 2010, entitled "Bid Bond".

1. Bond shall be by an acceptable Surety Company licensed to do business in the State of **Indiana**.
2. A copy of this form is bound herewith.

C. Bid Security shall be:

1. In an amount equal to five (5) percent of the total lump sum base bid plus (5) percent of all add alternates.
2. Security shall be executed in favor of the Owner.
3. Should the successful Bidder fail to enter into a contract or furnish the required Bonds within ten (10) days from date of notice of award, the Owner may declare the Bidder's Bid Security forfeited and the Security amount retained by the Owner as liquidated damages.

D. Refer to Section 00 43 93 - Contractor's Bid Submittal Checklist for requirements as to time of submission.

END OF SECTION 00 43 13

SECTION 00 43 93 – CONTRACTOR'S BID SUBMITTAL CHECKLIST

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Section Includes:
1. Submittals required at time of bid.
  2. Submittals required following bid.

1.02 BID SUBMITTALS

- A. The following items are to be submitted by all bidders for all contracts at the time of bidding:
- 1. Proposal Form Parts I and II**
  - 2. Bid Security**
  - 3. Financial Statement (as required by Proposal Form)**
- B. Submit **two** copies (one signed original and one copy) of above information.

1.03 POST-BID SUBMITTALS

- A. The following items are to be submitted by each successful bidder for all contracts within Twenty-Four (24) hours following the time of bidding:
- 1. Schedule of Values**
  - 2. Subcontractor List**
- B. The following items are to be submitted prior to execution of the Owner-Contractor Agreement:
- 1. Performance Bond**
  - 2. Labor & Material Payment Bond**
  - 3. Certificate of Insurance**
  - 4. Indiana Certificate of Qualification for Public Works Projects**
  - 5. Signed Escrow Agreement**
  - 6. Employee Background Check**  
(per Section 00 73 01-Supplementary General Conditions, Article 13)
  - 7. Employee Drug and Alcohol Testing**  
(per Section 00 73 01-Supplementary General Conditions, Article 13)
  - 8. Employment Eligibility Verification**  
(per Section 00 73 01-Supplementary General Conditions, Article 13)
- C. Submit all above items to Architect for review and approval.

END OF SECTION 00 43 93

 **AIA** Document A310™ – 2010**Bid Bond****CONTRACTOR:***(Name, legal status and address)***SURETY:***(Name, legal status and principal place of business)***OWNER:***(Name, legal status and address)*

Medora Community Schools  
32 S. Perry Street  
Medora, Indiana 47260

**BOND AMOUNT: \$****PROJECT:***(Name, location or address, and Project number, if any)*

2024 HVAC Improvements  
Medora Community Schools  
82 S. George Johnson Road  
Medora, Indiana 47260

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or

**ADDITIONS AND DELETIONS:**

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

Init.

legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

Signed and sealed this    day of    ,

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*(Contractor as Principal)*

*(Seal)*

---

*(Witness)*

---

*(Title)*

---

*(Surety)*

*(Seal)*

---

*(Witness)*

---

*(Title)*



SECTION 00 45 46.02 – INDIANA CERTIFICATE OF QUALIFICATIONS FOR PUBLIC WORKS PROJECTS

1.01 PROJECT MANUAL

- A. All requirements of the Project Manual apply to this Section.

1.02 SCOPE

- A. All contractors shall have Indiana Certificate of Qualification for Public Works Projects per Indiana Code IC 5-16-13 prior to submitting a bid.
- B. A “contractor” requiring certification generally refers to a contractor in any contractor tier.
1. “Tier 1 contractor” has a direct contract with the government agency (Owner). This is also known as the “prime contractor” or “general contractor”.
  2. “Tier 2 contractor” has a direct contract with a Tier 1 contractor. This is also known as a subcontractor.
  3. “Tier 3 contractor” has a direct contract with a Tier 2 contractor. This is also known as a sub-subcontractor.
  4. “Lower tier contractor” has a direct contract with a Tier 3 contractor or lower tier contractor
  5. A supplier or firm not performing any work on site is not required to be qualified.
- D. A contractor of any tier is EXEMPT from requirements of this section if the total amount of their work awarded is less than Three Hundred Thousand dollars (\$300,000).

1.03 TIER 1 CONTRACTOR

- A. Must contribute a minimum of 15% of the initial contract amount by any combination of items 1, 2 or 3 listed below:
1. Work performed directly by Tier 1 contractor’s employees
  2. Materials supplied directly by Tier 1 contractor
  3. Services supplied directly by the Tier 1 contractor’s employees

1.04 INSURANCE REQUIREMENTS

- A. Minimum requirements for each individual or firm in any contractor tier:
- B. See Supplementary General Conditions, Section 00 73 01, Article 11

1.05 DRUG TESTING

- A. Per Indiana Code, IC-4-13-18
1. Required of all contractors, regardless of tier.
  2. Written plan for employee drug testing program that complies with IC-4-13-18

1.06 EMPLOYEE VERIFICATION

- A. Per Indiana Code, IC-22-5-1.7-3
1. Required of all contractors, regardless of tier.
  2. Participate in the E-Verify Program

1.07 APPRENTICESHIP & TRAINING PROGRAM

- A. Per Indiana Code, IC-5-16-13-12
  
- B. Contractors with 10 or more employees
  - 1. Provide access to training program applicable to tasks performed in normal course of employment.
  - 2. Compliance may be accomplished through any of the following:
    - a. Apprenticeship program
    - b. Programs offered by Ivy Tech Community College of Indiana
    - c. Programs offered by Vincennes University
    - d. Programs established by or for the contractor
    - e. Programs offered by an entity sponsored by the US Dept of Labor
    - f. Programs that results in the award of industry recognized portable certification
    - g. Programs approved by US Dept of Transportation or INDOT.
  
- C. Tier 1 and tier 2 contractors with 50 or more employees
  - 1. Must participate in an apprenticeship or training program which meets the standards of any of the following:
    - a. The US Department of Labor, Bureau of Apprenticeship and Training
    - b. The Indiana Department of Labor
    - c. The US Department of Transportation, Federal Highway Administration
    - d. INDOT

1.08 RECORDS

- A. Per Indiana Code, IC-5-16-13-13
  
- B. Payroll and related records of a contractor in any contractor tier must be:
  - 1. Preserved by the contractor for a period of three (3) years after completion
  - 2. Open to inspection by the department of workforce development

END OF SECTION 00 45 46.02

SECTION 00 52 00 - AGREEMENT FORM

1.01 PROJECT MANUAL

All requirements of the Project Manual shall apply to this Section.

1.02 SCOPE

A. The agreement shall be AIA Document A101 - 2017, entitled "Standard Form of Agreement Between Owner and Contractor".

1. Where the basis of payment is a stipulated sum.
2. Copy of this form is bound herewith.

B. This form, when fully executed, becomes a part of the successful Bidder's Contract Documents.

END OF SECTION 00 52 00





# AIA® Document A101™ – 2017

## Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

**AGREEMENT** made as of the    day of    in the year  
*(In words, indicate day, month and year.)*

**BETWEEN** the Owner:  
*(Name, legal status, address and other information)*

Medora Community Schools  
32 S. Perry Street  
Medora, Indiana 47260

and the Contractor:  
*(Name, legal status, address and other information)*

for the following Project:  
*(Name, location and detailed description)*

2024 HVAC Improvements  
Medora Community Schools  
82 S. George Johnson Road  
Medora, Indiana 47260

The Architect:  
*(Name, legal status, address and other information)*

Tower Pinkster Titus Associates, Inc  
320 Pearl Street, Suite 100  
New Albany, IN 47150

The Owner and Contractor agree as follows.

### ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

The parties should complete A101™–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201™–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

Init.

## TABLE OF ARTICLES

- 1 THE CONTRACT DOCUMENTS
- 2 THE WORK OF THIS CONTRACT
- 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION
- 4 CONTRACT SUM
- 5 PAYMENTS
- 6 DISPUTE RESOLUTION
- 7 TERMINATION OR SUSPENSION
- 8 MISCELLANEOUS PROVISIONS
- 9 ENUMERATION OF CONTRACT DOCUMENTS

### EXHIBIT A INSURANCE AND BONDS

#### ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

#### ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

#### ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:

*(Check one of the following boxes.)*

- The date of this Agreement.
- A date set forth in a notice to proceed issued by the Owner.
- Established as follows:

*(Insert a date or a means to determine the date of commencement of the Work.)*

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

#### § 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:

Init.

/

(Check one of the following boxes and complete the necessary information.)

Not later than ( ) calendar days from the date of commencement of the Work.

By the following date:

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date
-----------------	-----------------------------

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

#### ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be (\$ ), subject to additions and deductions as provided in the Contract Documents.

#### § 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price
------	-------

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement. (Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance
------	-------	---------------------------

§ 4.3 Allowances, if any, included in the Contract Sum: (Identify each allowance.)

Item	Price
------	-------

§ 4.4 Unit prices, if any: (Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit (\$0.00)
------	-----------------------	-------------------------

§ 4.5 Liquidated damages, if any: (Insert terms and conditions for liquidated damages, if any.)

§ 4.6 Other: (Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

## ARTICLE 5 PAYMENTS

### § 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the day of the month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than ( ) days after the Architect receives the Application for Payment.

*(Federal, state or local laws may require payment within a certain period of time.)*

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

- .1 That portion of the Contract Sum properly allocable to completed Work;
- .2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and
- .3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

- .1 The aggregate of any amounts previously paid by the Owner;
- .2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;
- .3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- .4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and
- .5 Retainage withheld pursuant to Section 5.1.7.

### § 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:

*(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)*

**§ 5.1.7.1.1** The following items are not subject to retainage:  
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

**§ 5.1.7.2** Reduction or limitation of retainage, if any, shall be as follows:  
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

**§ 5.1.7.3** Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:  
(Insert any other conditions for release of retainage upon Substantial Completion.)

**§ 5.1.8** If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

**§ 5.1.9** Except with the Owner’s prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

## **§ 5.2 Final Payment**

**§ 5.2.1** Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

- .1 the Contractor has fully performed the Contract except for the Contractor’s responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and
- .2 a final Certificate for Payment has been issued by the Architect.

**§ 5.2.2** The Owner’s final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect’s final Certificate for Payment, or as follows:

## **§ 5.3 Interest**

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

(Insert rate of interest agreed upon, if any.)

%

## **ARTICLE 6 DISPUTE RESOLUTION**

### **§ 6.1 Initial Decision Maker**

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.  
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

**§ 6.2 Binding Dispute Resolution**

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:

*(Check the appropriate box.)*

- Arbitration pursuant to Section 15.4 of AIA Document A201–2017
- Litigation in a court of competent jurisdiction
- Other *(Specify)*

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

**ARTICLE 7 TERMINATION OR SUSPENSION**

**§ 7.1** The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

**§ 7.1.1** If the Contract is terminated for the Owner’s convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:

*(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner’s convenience.)*

**§ 7.2** The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

**ARTICLE 8 MISCELLANEOUS PROVISIONS**

**§ 8.1** Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

**§ 8.2** The Owner’s representative:

*(Name, address, email address, and other information)*

**§ 8.3** The Contractor’s representative:

*(Name, address, email address, and other information)*



§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

**§ 8.5 Insurance and Bonds**

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:

*(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)*

§ 8.7 Other provisions:

**ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS**

§ 9.1 This Agreement is comprised of the following documents:

- .1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor
- .2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds
- .3 AIA Document A201™–2017, General Conditions of the Contract for Construction
- .4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:  
*(Insert the date of the E203-2013 incorporated into this Agreement.)*

.5 Drawings

Number	Title	Date
--------	-------	------

.6 Specifications

Section	Title	Date	Pages
---------	-------	------	-------

.7 Addenda, if any:

Number	Date	Pages
--------	------	-------

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:

*(Check all boxes that apply and include appropriate information identifying the exhibit where required.)*

Init.

AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:  
(Insert the date of the E204-2017 incorporated into this Agreement.)

The Sustainability Plan:

Title	Date	Pages
-------	------	-------

Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages
----------	-------	------	-------

**.9** Other documents, if any, listed below:

*(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor’s bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)*

This Agreement entered into as of the day and year first written above.

\_\_\_\_\_  
**OWNER** (Signature)

\_\_\_\_\_  
**CONTRACTOR** (Signature)

\_\_\_\_\_  
(Printed name and title)

\_\_\_\_\_  
(Printed name and title)

Init.

/



SECTION 00 52 99 - ESCROW AGREEMENT

1.01 PROJECT MANUAL

All requirements of the Project Manual shall apply to this Section.

1.02 SCOPE

- A. All funds retained by the Owner from approved certificates for payment shall be placed in Escrow per **Indiana** Statutes.
1. Escrow Agreement Form shall be provided by the Escrow Agent and shall be acceptable to both the Owner and the Contractor.
  2. Escrow Agreement, when executed shall become a part of the Contract Documents.
  3. All escrowed funds shall be deposited in a financial institute as agreed upon by both parties to the Contract.

END OF SECTION 00 52 99



# AIA<sup>®</sup> Document A312<sup>™</sup> – 2010

## Performance Bond

**CONTRACTOR:**

*(Name, legal status and address)*

**SURETY:**

*(Name, legal status and principal place of business)*

**OWNER:**

*(Name, legal status and address)*  
Medora Community Schools  
32 S. Perry Street  
Medora, Indiana 47260

**CONSTRUCTION CONTRACT**

Date:

Amount: \$

Description:

*(Name and location)*

2024 HVAC Improvements  
Medora Community Schools  
82 S. George Johnson Road  
Medora, Indiana 47260

**BOND**

Date:

*(Not earlier than Construction Contract Date)*

Amount: \$

Modifications to this Bond:

**CONTRACTOR AS PRINCIPAL**

Company: *(Corporate Seal)*

Signature: \_\_\_\_\_

Name and  
Title:

*(Any additional signatures appear on the last page of this Performance Bond.)*

**SURETY**

Company: *(Corporate Seal)*

Signature: \_\_\_\_\_

Name and  
Title:

*(FOR INFORMATION ONLY — Name, address and telephone)*

**AGENT or BROKER:****OWNER'S REPRESENTATIVE:**

*(Architect, Engineer or other party:)*

Email Address:

**ADDITIONS AND DELETIONS:**

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

Init.

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User Notes:

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**§ 1** The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

**§ 2** If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

**§ 3** If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

- .1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;
- .2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
- .3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

**§ 4** Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

**§ 5** When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

**§ 5.1** Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

**§ 5.2** Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

**§ 5.3** Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

**§ 5.4** Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

- .1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or
- .2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

**§ 6** If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

§ 7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

- .1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
- .2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and
- .3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ 8 If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

§ 9 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

§ 10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

#### § 14 Definitions

**§ 14.1 Balance of the Contract Price.** The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

**§ 14.2 Construction Contract.** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

**§ 14.3 Contractor Default.** Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

**§ 14.4 Owner Default.** Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

**§ 14.5 Contract Documents.** All the documents that comprise the agreement between the Owner and Contractor.

§ 15 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 16 Modifications to this bond are as follows:

*(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)*

**CONTRACTOR AS PRINCIPAL**

Company: \_\_\_\_\_ *(Corporate Seal)*  
Signature: \_\_\_\_\_

Name and Title: \_\_\_\_\_  
Address: \_\_\_\_\_

**SURETY**

Company: \_\_\_\_\_ *(Corporate Seal)*  
Signature: \_\_\_\_\_

Name and Title: \_\_\_\_\_  
Address: \_\_\_\_\_

Init.

/

SECTION 00 61 13 – CONTRACTOR’S BOND FOR CONSTRUCTION

1.01 PROJECT MANUAL

All requirements of the Project Manual shall apply to this Section.

1.02 SCOPE

- A. The Performance Bond and Labor and Material Payment Bond shall be AIA Document A312 - 2010, comprised of two sections entitled “Performance Bond” and “Payment Bond”.
  - 1. Bonds shall be executed by an acceptable Surety Company licensed to do business in the State of **Indiana**.
  - 2. A copy of this form is bound herewith.
- B. Bonds shall be executed in an amount equal to one hundred percent (100%) of the contract amount in favor of the Owner conditioned on the full and faithful performance of the contract and full payment of all obligations arising there under.
- C. This form when fully executed becomes a part of the successful bidder’s Contract Documents.

END OF SECTION 00 61 13



# AIA® Document A312™ – 2010

## Payment Bond

**CONTRACTOR:**

*(Name, legal status and address)*

**SURETY:**

*(Name, legal status and principal place of business)*

**OWNER:**

*(Name, legal status and address)*

Medora Community Schools  
32 S. Perry Street  
Medora, Indiana 47260

**CONSTRUCTION CONTRACT**

Date:

Amount: \$

Description:

*(Name and location)*

2024 HVAC Improvements  
Medora Community Schools  
82 S. George Johnson Road  
Medora, Indiana 47260

**BOND**

Date:

*(Not earlier than Construction Contract Date)*

Amount: \$

Modifications to this Bond:

**CONTRACTOR AS PRINCIPAL**

Company: *(Corporate Seal)*

Signature: \_\_\_\_\_

**SURETY**

Company: *(Corporate Seal)*

Signature: \_\_\_\_\_

Name and \_\_\_\_\_

Title:

*(Any additional signatures appear on the last page of this Payment Bond.)*

Name and \_\_\_\_\_

Title:

*(FOR INFORMATION ONLY — Name, address and telephone)*

**AGENT or BROKER:**

**OWNER'S REPRESENTATIVE:**

*(Architect, Engineer or other party:)*

Email Address:

**ADDITIONS AND DELETIONS:**

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

Init.

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User Notes:

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§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

- .1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
- .2 have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.



**§ 10** The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

**§ 11** The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

**§ 12** No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

**§ 13** Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

**§ 14** When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

**§ 15** Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

## **§ 16 Definitions**

**§ 16.1 Claim.** A written statement by the Claimant including at a minimum:

- .1 the name of the Claimant;
- .2 the name of the person for whom the labor was done, or materials or equipment furnished;
- .3 a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- .4 a brief description of the labor, materials or equipment furnished;
- .5 the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- .6 the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- .7 the total amount of previous payments received by the Claimant; and
- .8 the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

**§ 16.2 Claimant.** An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

**§ 16.3 Construction Contract.** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

**§ 16.4 Owner Default.** Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

**§ 16.5 Contract Documents.** All the documents that comprise the agreement between the Owner and Contractor.

**§ 17** If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

**§ 18** Modifications to this bond are as follows:

*(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)*

**CONTRACTOR AS PRINCIPAL**

Company: \_\_\_\_\_ *(Corporate Seal)*  
Signature: \_\_\_\_\_

Name and Title: \_\_\_\_\_  
Address: \_\_\_\_\_

**SURETY**

Company: \_\_\_\_\_ *(Corporate Seal)*  
Signature: \_\_\_\_\_

Name and Title: \_\_\_\_\_  
Address: \_\_\_\_\_

SECTION 00 72 00 - GENERAL CONDITIONS

1.01 PROJECT MANUAL

All requirements of the Project Manual shall apply to this Section.

1.02 SCOPE

A. The General Conditions shall be AIA Document A201 - 2017, entitled "General Conditions of the Contract for Construction".

1. A copy of which is bound herewith.

END OF SECTION 00 72 00



# AIA<sup>®</sup> Document A201<sup>™</sup> – 2017

## General Conditions of the Contract for Construction

for the following PROJECT:  
(Name and location or address)

2024 HVAC Improvements  
Medora Community Schools  
82 S. George Johnson Road  
Medora, Indiana 47260

**THE OWNER:**  
(Name, legal status and address)

Medora Community Schools  
32 S. Perry Street  
Medora, Indiana 47260

**THE ARCHITECT:**  
(Name, legal status and address)

Tower Pinkster Titus Associates, Inc  
320 Pearl Street, Suite 100  
New Albany, IN 47150

### TABLE OF ARTICLES

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- 3 CONTRACTOR
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- 5 SUBCONTRACTORS
- 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS
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- 8 TIME
- 9 PAYMENTS AND COMPLETION
- 10 PROTECTION OF PERSONS AND PROPERTY
- 11 INSURANCE AND BONDS
- 12 UNCOVERING AND CORRECTION OF WORK
- 13 MISCELLANEOUS PROVISIONS

### ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503<sup>™</sup>, Guide for Supplementary Conditions.

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User Notes:

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## ARTICLE 1 GENERAL PROVISIONS

### § 1.1 Basic Definitions

#### § 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

#### § 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

#### § 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

#### § 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

#### § 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

#### § 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

#### § 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

#### § 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

### § 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent



consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

**§ 1.2.1.1** The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

**§ 1.2.2** Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

**§ 1.2.3** Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

### **§ 1.3 Capitalization**

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

### **§ 1.4 Interpretation**

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

### **§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service**

**§ 1.5.1** The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

**§ 1.5.2** The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

### **§ 1.6 Notice**

**§ 1.6.1** Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

**§ 1.6.2** Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

### **§ 1.7 Digital Data Use and Transmission**

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

## § 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

## ARTICLE 2 OWNER

### § 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

### § 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

### § 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements,

assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

**§ 2.3.2** The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

**§ 2.3.3** If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

**§ 2.3.4** The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

**§ 2.3.5** The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

**§ 2.3.6** Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

#### **§ 2.4 Owner's Right to Stop the Work**

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

#### **§ 2.5 Owner's Right to Carry Out the Work**

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

### **ARTICLE 3 CONTRACTOR**

#### **§ 3.1 General**

**§ 3.1.1** The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

**§ 3.1.2** The Contractor shall perform the Work in accordance with the Contract Documents.

**§ 3.1.3** The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

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### § 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

### § 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

### § 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

**§ 3.4.2** Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

**§ 3.4.3** The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

### **§ 3.5 Warranty**

**§ 3.5.1** The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

**§ 3.5.2** All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

### **§ 3.6 Taxes**

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

### **§ 3.7 Permits, Fees, Notices and Compliance with Laws**

**§ 3.7.1** Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

**§ 3.7.2** The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

**§ 3.7.3** If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

### **§ 3.7.4 Concealed or Unknown Conditions**

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

**§ 3.7.5** If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

### **§ 3.8 Allowances**

**§ 3.8.1** The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

**§ 3.8.2** Unless otherwise provided in the Contract Documents,

- .1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- .2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- .3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

**§ 3.8.3** Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

### **§ 3.9 Superintendent**

**§ 3.9.1** The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

**§ 3.9.2** The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

**§ 3.9.3** The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

### **§ 3.10 Contractor's Construction and Submittal Schedules**

**§ 3.10.1** The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

**§ 3.10.2** The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the

Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

**§ 3.10.3** The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

### **§ 3.11 Documents and Samples at the Site**

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

### **§ 3.12 Shop Drawings, Product Data and Samples**

**§ 3.12.1** Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

**§ 3.12.2** Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

**§ 3.12.3** Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

**§ 3.12.4** Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

**§ 3.12.5** The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

**§ 3.12.6** By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

**§ 3.12.7** The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

**§ 3.12.8** The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.



§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

### § 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

### § 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

### § 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

### § 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

### § 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

### § 3.18 Indemnification

**§ 3.18.1** To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

**§ 3.18.2** In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

## ARTICLE 4 ARCHITECT

### § 4.1 General

**§ 4.1.1** The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

**§ 4.1.2** Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

### § 4.2 Administration of the Contract

**§ 4.2.1** The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

**§ 4.2.2** The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

**§ 4.2.3** On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the

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Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

#### **§ 4.2.4 Communications**

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

**§ 4.2.5** Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

**§ 4.2.6** The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

**§ 4.2.7** The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

**§ 4.2.8** The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

**§ 4.2.9** The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

**§ 4.2.10** If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

**§ 4.2.11** The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

**§ 4.2.12** Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations

and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

**§ 4.2.13** The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

**§ 4.2.14** The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

## **ARTICLE 5 SUBCONTRACTORS**

### **§ 5.1 Definitions**

**§ 5.1.1** A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

**§ 5.1.2** A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

### **§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work**

**§ 5.2.1** Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

**§ 5.2.2** The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

**§ 5.2.3** If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

**§ 5.2.4** The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

### **§ 5.3 Subcontractual Relations**

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor,



prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Subcontractors.

#### **§ 5.4 Contingent Assignment of Subcontracts**

**§ 5.4.1** Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- .2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

**§ 5.4.2** Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

**§ 5.4.3** Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

### **ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS**

#### **§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts**

**§ 6.1.1** The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

**§ 6.1.2** When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

**§ 6.1.3** The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

**§ 6.1.4** Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

#### **§ 6.2 Mutual Responsibility**

**§ 6.2.1** The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

**§ 6.2.2** If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work,

promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

**§ 6.2.3** The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

**§ 6.2.4** The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

**§ 6.2.5** The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

### **§ 6.3 Owner's Right to Clean Up**

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

## **ARTICLE 7 CHANGES IN THE WORK**

### **§ 7.1 General**

**§ 7.1.1** Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

**§ 7.1.2** A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

**§ 7.1.3** Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

### **§ 7.2 Change Orders**

**§ 7.2.1** A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

- .1 The change in the Work;
- .2 The amount of the adjustment, if any, in the Contract Sum; and
- .3 The extent of the adjustment, if any, in the Contract Time.

### **§ 7.3 Construction Change Directives**

**§ 7.3.1** A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

**§ 7.3.2** A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

**§ 7.3.3** If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

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- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

- .1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
- .2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
- .5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

#### § 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will

affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

## **ARTICLE 8 TIME**

### **§ 8.1 Definitions**

**§ 8.1.1** Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

**§ 8.1.2** The date of commencement of the Work is the date established in the Agreement.

**§ 8.1.3** The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

**§ 8.1.4** The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

### **§ 8.2 Progress and Completion**

**§ 8.2.1** Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

**§ 8.2.2** The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

**§ 8.2.3** The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

### **§ 8.3 Delays and Extensions of Time**

**§ 8.3.1** If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

**§ 8.3.2** Claims relating to time shall be made in accordance with applicable provisions of Article 15.

**§ 8.3.3** This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

## **ARTICLE 9 PAYMENTS AND COMPLETION**

### **§ 9.1 Contract Sum**

**§ 9.1.1** The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

**§ 9.1.2** If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

### **§ 9.2 Schedule of Values**

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and



unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

### **§ 9.3 Applications for Payment**

**§ 9.3.1** At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

**§ 9.3.1.1** As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

**§ 9.3.1.2** Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

**§ 9.3.2** Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

**§ 9.3.3** The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

### **§ 9.4 Certificates for Payment**

**§ 9.4.1** The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

**§ 9.4.2** The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

## § 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or a Separate Contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

## § 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

**§ 9.6.6** A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

**§ 9.6.7** Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

**§ 9.6.8** Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

### **§ 9.7 Failure of Payment**

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

### **§ 9.8 Substantial Completion**

**§ 9.8.1** Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

**§ 9.8.2** When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

**§ 9.8.3** Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

**§ 9.8.4** When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

**§ 9.8.5** The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

## **§ 9.9 Partial Occupancy or Use**

**§ 9.9.1** The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

**§ 9.9.2** Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

**§ 9.9.3** Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

## **§ 9.10 Final Completion and Final Payment**

**§ 9.10.1** Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

**§ 9.10.2** Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

**§ 9.10.3** If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.



**§ 9.10.4** The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- .1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents;
- .3 terms of special warranties required by the Contract Documents; or
- .4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

**§ 9.10.5** Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

## **ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY**

### **§ 10.1 Safety Precautions and Programs**

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

### **§ 10.2 Safety of Persons and Property**

**§ 10.2.1** The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

- .1 employees on the Work and other persons who may be affected thereby;
- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

**§ 10.2.2** The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

**§ 10.2.3** The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

**§ 10.2.4** When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

**§ 10.2.5** The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

**§ 10.2.6** The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

**§ 10.2.7** The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

### § 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

### § 10.3 Hazardous Materials and Substances

**§ 10.3.1** The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

**§ 10.3.2** Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

**§ 10.3.3** To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

**§ 10.3.4** The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

**§ 10.3.5** The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

**§ 10.3.6** If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

### § 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

## ARTICLE 11 INSURANCE AND BONDS

### § 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 **Notice of Cancellation or Expiration of Contractor's Required Insurance.** Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

### § 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 **Failure to Purchase Required Property Insurance.** If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 **Notice of Cancellation or Expiration of Owner's Required Property Insurance.** Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

### § 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

### § 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

### § 11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

## ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

### § 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to



the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

## **§ 12.2 Correction of Work**

### **§ 12.2.1 Before Substantial Completion**

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

### **§ 12.2.2 After Substantial Completion**

**§ 12.2.2.1** In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

**§ 12.2.2.2** The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

**§ 12.2.2.3** The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

**§ 12.2.3** The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

**§ 12.2.4** The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

**§ 12.2.5** Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

## **§ 12.3 Acceptance of Nonconforming Work**

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

## **ARTICLE 13 MISCELLANEOUS PROVISIONS**

### **§ 13.1 Governing Law**

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

## § 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

## § 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

## § 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

## § 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

## ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

### § 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- .3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- .4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

### § 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- .4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance,

the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

#### **§ 14.3 Suspension by the Owner for Convenience**

**§ 14.3.1** The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

**§ 14.3.2** The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- .1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of the Contract.

#### **§ 14.4 Termination by the Owner for Convenience**

**§ 14.4.1** The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

**§ 14.4.2** Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- .1 cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

**§ 14.4.3** In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

### **ARTICLE 15 CLAIMS AND DISPUTES**

#### **§ 15.1 Claims**

##### **§ 15.1.1 Definition**

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

##### **§ 15.1.2 Time Limits on Claims**

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

##### **§ 15.1.3 Notice of Claims**

**§ 15.1.3.1** Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.



**§ 15.1.3.2** Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

#### **§ 15.1.4 Continuing Contract Performance**

**§ 15.1.4.1** Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

**§ 15.1.4.2** The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

#### **§ 15.1.5 Claims for Additional Cost**

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

#### **§ 15.1.6 Claims for Additional Time**

**§ 15.1.6.1** If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

**§ 15.1.6.2** If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

#### **§ 15.1.7 Waiver of Claims for Consequential Damages**

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

- .1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- .2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

#### **§ 15.2 Initial Decision**

**§ 15.2.1** Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

**§ 15.2.2** The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the

Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

**§ 15.2.3** In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

**§ 15.2.4** If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

**§ 15.2.5** The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

**§ 15.2.6** Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

**§ 15.2.6.1** Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

**§ 15.2.7** In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

**§ 15.2.8** If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

### **§ 15.3 Mediation**

**§ 15.3.1** Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

**§ 15.3.2** The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

**§ 15.3.3** Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

#### § 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

#### § 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

**SECTION 00 73 01 - SUPPLEMENTARY GENERAL CONDITIONS**

Unless otherwise provided in these Supplemental Conditions, all work shall be governed by the terms of AIA Document A201 - 2017, entitled "General Conditions of the Contract for Construction". The following Supplemental Conditions, modify, delete from and add to AIA A201. Where an Article Paragraph, Subparagraph or Clause of AIA A201 is modified, deleted from or added to by these Supplemental Conditions, the unaltered provisions of that Article, Paragraph, Subparagraph or Clause shall remain in full force and effect. To the extent that there is any conflict or ambiguity between AIA A201 and these Supplemental Conditions, then these Supplemental Conditions shall control.

**ARTICLE 1 - GENERAL PROVISIONS**

**1.1.1 THE CONTRACT DOCUMENTS**

Add the following:

The Contract Documents also include the following bid documents:

1. Proposal Form (Form 96, Part I and II) – Contractor's Bid for Public Works.

**1.1.5 THE DRAWINGS**

Add the following Paragraphs:

- |         |   |
|---------|---|
| 1.1.5.1 | The Drawings are a graphic representation intended to convey the design intent of the Project. They are a 2-dimensional representation of a 3-dimensional Project, and they do not provide a detail for every construction condition of the project. The Drawings are a small-scale representation of complex construction assemblies and components, and not every element of the Project can be indicated in these small scale representations. The Drawings are not an instruction manual, nor are they assembly instructions. They are meant for use by experienced, competent construction professionals with the ability to read, interpret, co-ordinate, interpolate and infer information from them. The Drawings do not indicate every component and assembly necessary to construct the Project. It is the Contractor's responsibility to provide all components and assemblies necessary to provide a safe, complete and finished Project, which is reasonably fit for its intended purpose, whether or not such components and assemblies are detailed on the Drawings. |
| 1.1.5.2 | In general, all drawings are diagrammatic and schematic, and cannot indicate every offset, fitting, and accessory, nor can they indicate the field coordination work required to avoid all conflict with other trades. Contractor shall check drawings, shop drawings, and actual equipment of other trades to verify spaces available and make reasonable modifications, as directed, without extra cost to Owner; maintain headroom and other requirements in all areas; and where such requirements appear inadequate, notify Architect/Engineer before proceeding.  |

**1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS**

Add the following sentence to Paragraph 1.2.1:

It is the Contractor's responsibility to provide all work necessary for a complete and finished Project of first class quality. The Contractor will work skillfully, carefully and will perform in all respects in a workmanlike manner.

Add the following Paragraphs 1.2.2.1 and 1.2.3.1:

- 1.2.2.1 The Drawings are not intended to define the scope of work among various trades, sub-contractors,

material suppliers and vendors. The sheet numbering system is for the convenience of the Architect and the Architect's consultants only, and is not intended to define a sub-contractor's or material supplier's scope of work. Information is detailed, described and located at various locations throughout the Drawings. No consideration will be given to requests for change orders which relate to a failure of the Contractor, or the Contractor's sub-contractors and suppliers to obtain and review a complete set of Contract Documents during bidding, nor to maintain a complete set of Contract Documents during construction. Where bidding is separated into a number of different prime contracts, this paragraph applies to each of the separate prime contracts.

- 1.2.3.1 In the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following priorities.
1. The Agreement
  2. Addenda, with those of later date having precedence over those of earlier date.
  3. The Supplementary Conditions.
  4. The General Conditions of the Contract for Construction.
  5. Drawings and Specifications.

In the case of an inconsistency between Drawings and Specifications or within either Document not clarified by addendum, the better quality or greater quantity of Work shall be provided in accordance with the Architect's interpretation. The Contractor has a duty to inquire about possible ambiguities and inconsistencies which are patent or obvious during the bidding process and will not receive additional compensation or be excused from resulting difficulties in performance for failure to point out any inconsistencies after that point. In the case of disregard by the Contractor of such inconsistencies and ambiguities, the Architect may require the Contractor to remove and correct work which has been installed at no additional cost to the Owner.

## **ARTICLE 2 - OWNER**

### **2.3 INFORMATION AND SERVICES REQUIRED OF THE OWNER**

- 2.3.4 DELETE Subparagraph 2.3.4 in its entirety and replace with the following:

Neither the Owner nor the Architect shall be liable for inaccuracies or omissions contained in any surveys for the site of the Project, nor shall any inaccuracies or omissions in such items relieve the Contractor of its responsibility to perform the Work in accordance with the Contract Documents.

## **ARTICLE 3 - CONTRACTOR**

### **3.3 SUPERVISION AND CONSTRUCTION PROCEDURES**

- 3.3.4 ADD the following new Subparagraph:

The Contractor shall maintain total control of and shall be fully responsible for the Contractor's employees, agents, representatives, workers, Subcontractors, sub-subcontractors and other such persons or entities, and shall remove from the Site any such persons or entities not in compliance with the Contract Documents as interpreted by the Architect or the Owner. The Contractor shall assure harmonious labor relations at and adjacent to the Site so as to prevent any delays, disruption or interference to the Work. The Contractor shall prevent strikes, sympathy strikes, slowdowns, work interruption, jurisdictional disputes or other labor disputes resulting for any reason whatsoever, from the acts or failure to act, of the employees of the Contractor or any of its Subcontractors material suppliers, or other such persons or entities. The Contractor agrees that it will bind and require all of its Subcontractors, material suppliers and other such persons or entities to agree to all of the provisions of

this subparagraph. If the Contractor or any of its Subcontractors, material suppliers or other such persons or entities fail to fulfill any of the covenants set forth in the Subparagraph, the Contractor will be deemed to be in default and substantial violation of the Contract Documents.

### **3.5 WARRANTY**

Add the following new Subparagraphs 3.5.3, 3.5.4, 3.5.5, 3.5.6, 3.5.7, 3.5.8, 3.5.9 and 3.5.10

- 3.5.3 For a period of one (1) year from the date of Substantial Completion, the Contractor warrants as provided in Subparagraph 3.5.1 and further warrants to the Owner, and the Architect that (a) all movable or adjustable work shall remain in working order, including hardware, doors, windows, apparatus, machinery, mechanical and electrical equipment and (b) the Contractor's portion of the Work shall be waterproof and weatherproof in every respect.
- 3.5.4 In addition to all the Contractor warranties and obligations to correct defective Work provided by law or as set forth in any of the Contract Documents, the Contractor agrees, upon notice from the Owner or the Architect, to pay for, and if requested, correct, repair, restore and cure any damage or injury, whenever the same shall occur or appear, resulting from any defects, omissions or failure in workmanship or materials, and indemnify, hold harmless, and defend the Owner against any and all claims, losses, costs, damages and expenses, including attorneys' fees, suffered by the Owner as a result of such damage or injury, whenever such damage or injury shall occur or appear.
- 3.5.5 The commencement and terms of the guarantees and warranties required by the Contract Documents shall not in any manner be affected by any delay in the commencement, progress or completion of the Work, regardless of the cause, therefore.
- 3.5.6 The foregoing guarantees and warranties shall not shorten any longer warranty or liability period provided for by law or in the Contract Documents or otherwise received from the Contractor or any Subcontractor, material supplier or manufacturer, nor supersede the terms of any special warranty given by the Contractor, nor shorten any period of the Contractor's legal liability for defective Work but shall be in addition thereto.
- 3.5.7 Notwithstanding anything to the contrary contained herein with respect to warranties, it is understood and agreed that the foregoing warranties and guarantees shall not affect, limit or impair the Owner's right against the Contractor with regard to latent defects in the Work which do not appear within the applicable warranty period and which could not, by the exercise of reasonable care and due diligence, be ascertained or discovered by the Owner within such warranty period. The Contractor shall correct and cure any such latent defects which are reported to the Contractor by the Owner in writing within ninety (90) days after such latent defect first appears or could, by the exercise of reasonable care and due diligence, be ascertained or discovered by the Owner.
- 3.5.8 Neither the acceptance of any of the Work by the Owner, in whole or in part, nor any payment, either partial or final, by the Owner to the Contractor, shall constitute a waiver by the Owner of any claims against the Contractor for defects in the Work, whether latent or apparent, and no such payment or acceptance of the Work by the Owner shall release or discharge the Contractor of the Contractor's surety, if any, from any such claims for breach of such warranties.
- 3.5.9 Upon completion of the Work, the Contractor shall furnish the Owner with all written warranties, guarantees, operating manuals, all shop drawings and submittals used in the project relative to equipment installed, and if requested by the Architect, a complete set of reproducible drawings with all field changes noted on them relating to the improvements constructed.

- 3.5.10 If required by the Owner or the Architect, the Contractor shall deliver to the Owner a signed affidavit stating that the Work has been constructed in accordance with the Contract Documents. If such affidavit is required, final payment or a final certificate for payment shall not be tendered until such affidavit has been delivered to the Owner.

### **3.6 TAXES**

- 3.6.1 ADD the following new Subparagraph:

Material and properties purchased by contracts with the Owner that become a permanent part of the structure or facilities constructed are not subject to the Indiana Gross Retail Tax (Sales Tax). The Contractor shall obtain a copy of the Owner's exemption certificate and then issue copies of this certificate to his suppliers when acquiring materials and properties for use on the Project. The Contractor shall enforce this exemption clause for his purchases and for those of his Subcontractors.

### **3.8 ALLOWANCES**

Refer to Section 01 21 16- Contingency Allowance for further provisions on this subject.

### **3.12 SHOP DRAWINGS, PROJECT DATA AND SAMPLES**

Refer to Section 01 33 00 - Submittal Procedures for further provisions on this subject.

### **3.13 USE OF SITE**

ADD the following new Subparagraphs 3.13.1 and 3.13.2:

- 3.13.1 If the Owner requires the contractor to relocate materials or equipment which have been stored on the Site or within the Project, the Contractor shall relocate such materials or equipment at no additional cost to the Owner.
- 3.13.2 The Contractor is solely responsible for its Site access. The Contractor shall keep all roads, walks, ramps and other areas on and adjacent to the Site in good working order and condition and free from obstructions which might present a hazard to or interference with traffic or the public. When construction operations necessitate the closing of traffic lanes, the Contractor shall be responsible for arranging such closings in advance with the authorities having jurisdiction, the Owner, and adjacent property Owners. The Contractor shall provide adequate barricades, signs and other devices for traffic guides and public safety. Contractor shall maintain all adjacent streets to that Project in a clean condition and shall clean all dirt and mud from the Project and from such adjacent street on a daily basis.

### **3.14 CUTTING AND PATCHING**

Refer to Section 01 73 29 - Cutting and Patching for further provisions on this subject.

### **3.15 CLEANING UP**

Refer to Section 01 74 23 - Cleaning for further provisions on this subject.

## **ARTICLE 4 – ARCHITECT**

### **4.2 ADMINISTRATION OF THE CONTRACT**

ADD the following new Subparagraphs 4.2.2.1:

- 4.2.2.1 The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for site visits made necessary by the fault of the Contractor or by defects or deficiencies in the Work.

**ARTICLE 6 - CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS**

**6.2 MUTUAL RESPONSIBILITY**

ADD the following new Subparagraphs 6.2.6 and 6.2.7:

- 6.2.6 No Contractor, other Contractor, or Subcontractor, shall be entitled or permitted to sue or make a claim against the Owner or the Architect on account of any delay, disruption or acceleration or damage related thereto. If, however, the Owner or the Architect is sued or receives a claim from a Contractor or other Contractor on account of any alleged delay, disruption, interference or acceleration or damage related thereto caused, or alleged to be caused, in whole or in part, by the Contractor, the Contractor shall defend and indemnify the Owner and the Architect therefore, and reimburse them for their attorney's fees, costs and expenses.
- 6.2.7 Inasmuch as the completion of the Project within the Contract Time is dependent upon the close and active cooperation of all those engaged therein, it shall be expressly understood and agreed that the Contractor shall lay out and install its Work at such time or times and in such manner as not to delay, interfere, or disrupt the Work of others.

**ARTICLE 7 - CHANGES IN THE WORK**

**7.1 GENERAL**

Add the following new Subparagraphs 7.1.4 and 7.1.5:

- 7.1.4 Consultants to Architect or Owner:
1. Consultants to Architect or Owner shall have NO authority to modify Contract requirements in the Scope of Work or Contract Time.
  2. Consultants to Architect or Owner shall have no direct communication with Contractor or subcontractors, suppliers and vendors to Contractor without the express consent of the Architect.
  3. Any direct communication authorized by the Architect shall be for clarifications of the Work only and shall not act to authorize any changes in the Scope of Work, Contract Sum or Contract Time.
- 7.1.5 The overhead, profit and commission percentages included in a Change Order or Construction Change Directive must not exceed the maximums given at the end of this paragraph, and will be considered to include, but not be limited to, insurance (other than Workman's Compensation Insurance, FICA, Medicare and FUTA), bonds, small tools, incidental job burdens, supervisory expense, project management expense, clerical expense, preparatory expense and general office expense. Workmen's Compensation Insurance, and employment taxes under FICA, Medicare and FUTA are to be itemized separately and no percentage for overhead, profit and commission will be allowed on them. The percentages for overhead, profit and commission will be negotiated and may vary according to the nature, extent and complexity of the work involved, but not to exceed the maximum percentages shown. Not more than three percentages will be allowed regardless of the number of tiers of sub-contractors; that is, the markup on work subcontracted by a subcontractor will be limited to one overhead percentage and one profit percentage in addition to the prime contractor's commission percentage. On proposals covering both increases and decreases in the amount of the contract, the overhead, profit, and where applicable, commission, will be computed on the net change only. On proposals for decreases in the amount of the contract, the overhead and profit shall be added to the decrease in direct cost:



<i>Description</i>	<i>Overhead</i>	<i>Profit</i>	<i>Commission</i>
To Contractor on work performed by other than his/her own forces	0%	0%	10%
To Contractor for that portion of work performed by his/her own forces	10%	10%	0%
To Sub-contractor for that portion of work performed by his/her own forces	10%	10%	0%

**7.3 CONSTRUCTION CHANGE DIRECTIVES**

Add the following new Subparagraph to 7.3.4.6:

7.3.4.6 Amount for overhead and profit as set forth in this Agreement shall be in accordance with the schedule set forth in Article 7.1.5.

**ARTICLE 8 - TIME**

**8.2 PROGRESS AND COMPLETION**

ADD the following Subparagraphs 8.2.4, 8.2.5 and 8.2.6:

8.2.4 Whenever it may be useful or necessary for the Owner to do so, the Owner may take possession of the Project or parts thereof at any time that it is determined by the Architect that the Work has been completed to a point where the Owner may occupy or use said Project, or parts thereof, without interference, delay or disruption to the continued execution of the work. The Owner may at such time install furnishings and equipment as it sees fit or may at its discretion hire other Contractors for this purpose. Such use or occupation shall not relieve the Contractor of these warranty obligations as provided in the Contract Documents nor shorten their commencement dates.

8.2.5 Except as otherwise provided herein, substantial completion of work shall be within the number of calendar days stated by the Contractor on the Proposal Form and shall become a contract obligation. The time for completion of the work shall be extended for the period of any excusable delay, which term shall include only those delays directly caused by any of the reasons enumerated in the following subparagraph 8.3.2 and 8.3.3.

8.2.6 Completion shall be understood to be substantially complete for the Owner's beneficial occupancy, with only minor Punch List" items yet to be completed and items such as balancing of heating system, etc., which cannot be completed due to climatic conditions.

**8.3 DELAYS AND EXTENSIONS OF TIME**

DELETE Subparagraph 8.3.1 in its entirety and substitute the following:

8.3.1 If the Work is delayed, disrupted, interfered with or constructively accelerated (hereinafter and collectively referred to as "Hindrances" or "Hindrances") at any time by any act or neglect of the Owner, the Architect, other Contractors or Subcontractors, or any of their employees, or by changes ordered in the Work, fire, unusual delay in transportation, unavoidable casualties, or other cause beyond the Contractor's control as elsewhere provided in the Contract Documents, then the Contract Time shall be increased by Change Order for such reasonable time as the Architect may determine.

DELETE Subparagraph 8.3.3 in its entirety and substitute the following:

8.3.3 Whether or not any Hindrance shall be the basis for an increase in the Contract Time, the Contractor shall have no claim against the Owner or the Architect for an increase in the Contract Sum, nor a claim against the Owner or the Architect for a payment or allowance of any kind for damage, loss or expense resulting from any Hindrance. As between the Contractor and the Owner, except for acts constituting intentional or grossly unreasonable interference by the Owner or the Architect with the Contractor's performance of the Work when such acts continue after the Contractor's written notice to the Owner of such interference or disruption, the Contractor shall assume the risk of all Hindrances arising from any and all causes whatsoever, including without limitation, those due to any act or omission of the Owner or the Architect, except only to the extent that an increase to the Contract Time may be due to the Contractor as expressly provided for in this Subparagraph. The Contractor shall bear all costs, expenses and liabilities in connection with Hindrances and all costs, expenses and liabilities of any nature whatsoever, whether or not provided for in the Contract Documents, shall conclusively be deemed to have been within the contemplation of the parties. The only remedy available to the Contractor shall be an increase in the Contract Time.

ADD the following new Subparagraphs 8.3.4, 8.3.5 and 8.3.6:

8.3.4 The Owner's exercise of any of its rights under the Contract Documents, including but not limited to its rights regarding changes in the Work, regardless of extent or number of such changes, performance of separate Work or carrying of the Work by the Owner or the Architect, directing overtime or changes in the sequence of the Work, withholding payment or otherwise exercising its rights hereunder, or exercising any of its remedies of suspension of the Work or requirements of correction or re-execution of any defective Work shall not, under any circumstances, be construed as intentional interference or disruption with the Work.

8.3.5 No increase in the Contract Time shall be granted for any Hindrance resulting from unsuitable ground conditions, inadequate forces, the failure of the Contractor to place orders for equipment or materials sufficiently in advance to insure their delivery when needed, or any Hindrance resulting from interruptions to or suspensions of the Work so as to enable others to perform their Work, other than as specifically provided elsewhere in the Contract Documents.

8.3.6 If the Contractor causes a Hindrance to the Work so as to cause any damage to the Owner or any damages for which the Owner may become liable, the Contractor shall be liable therefore and the Owner may withhold from any amount yet due the Contractor the amount reasonably required to compensate the Owner for such damages, if the amount of compensation exceeds the amount yet paid to the Contractor, the Contractor shall pay the difference to the Owner immediately upon demand.

## **ARTICLE 9 - PAYMENTS AND COMPLETION**

### **9.2 SCHEDULE OF VALUES**

Add the following new Subparagraph 9.2.1:

9.2.1 Contractor shall obtain written concurrence in such schedule of values from the Surety furnishing any Performance Bond and Labor and Materials Payment Bond. Copy of written concurrence by the Surety shall be submitted by the time of written submission.

### **9.3 APPLICATIONS FOR PAYMENT**

ADD the following new Subparagraphs: 9.3.1.3, 9.3.1.4, 9.3.1.5, and 9.3.1.6:

- 9.3.1.3 The Owner will pay ninety-five percent (95%) of the amount due the Contractor on Account of progress payments for the entire period of the Contract.
- 9.3.1.4 A subcontractor shall be paid ninety-five percent (95%) of the earned sum by the Contractor for the entire period of the Contract.
- 9.3.1.5 The Owner, Contractor and the Architect/Engineer shall cooperate to the end that retentions shall be paid promptly when all conditions of the Contract have been met.
- 9.3.1.6 Applications for payment, subsequent to the first application, shall be accompanied by Waivers of Lien from the Contractor and all major subcontractors, suppliers, and vendors.

ADD the following at the end of Subparagraph 9.3.3:

- 9.3.3 This provision shall not be construed as relieving the Contractor from the sole responsibility and expense for the care and protection of materials and Work upon which payments have been made or the restoration of any stolen, destroyed or damaged Work, or as a waiver of the right of the Owner to require the fulfillment of all of the terms of the Contract Documents.

## **9.5 DECISIONS TO WITHHOLD CERTIFICATION**

ADD the following new Subparagraph 9.5.5:

- 9.5.5 If any claim or lien is made or filed with or against the Owner, the Architect, the Project, or the Contract Sum by any persons or entity claiming that the Contractor, Subcontractor, or other person for whom the Contractor is responsible has failed to make payment for labor, services, materials, equipment, taxes or other items or obligations furnished or incurred in connection with the Work, or if at any time there shall be any evidence of such non-payment of any claim or lien which is chargeable to the Contractor, or if the Contractor, Subcontractor, or other person or entity for whom the Contractor is responsible caused damage to any Work on the project, or if the Contractor fails to perform or is otherwise in default under any terms or provisions of the Contract, the Owner shall have the right to retain from any payment then due or thereafter an amount which it deems sufficient to (1) satisfy, discharge and/or defend against such claim, lien, or action brought for judgment which may be recovered thereon, (2) make good any such non-payment, damage, failure, or default (3) compensate the Owner and Architect for any and all losses, liabilities, damages, costs, and expenses, including legal fees and costs, which may be sustained or incurred by either or both of them in connection therewith. The Owner shall have the right to apply and charge against the Contractor retained amounts as may be required for these purposes. If the amount retained is insufficient, the Contractor shall be liable for the difference and pay it directly to the Owner.

## **9.6 PROGRESS PAYMENTS**

DELETE Subparagraph 9.6.6 in its entirety and replace with the following:

- 9.6.6 No recommendation or certification of a progress payment, any progress payment, final payment, or any partial or entire use or occupancy of the Project by the Owner, shall constitute acceptance of any Work not in accordance with the Contract Documents.

ADD the following new Subparagraph 9.6.8:

- 9.6.8 On all Contracts totaling two hundred thousand dollars (\$200,000.00) or more, an escrow account shall be established in a financial institution, as escrow agent, selected by mutual agreement between the Contractor and the Owner at the time Contracts are executed. The establishing of the escrow account

shall be in compliance with the requirement of Indiana Code 36-1-12-14.

1. The Escrow Agent shall invest all escrowed principal in obligations selected by the Escrow Agent.
2. The Escrow Agent shall hold the escrowed principal and income until receipt of notice from the Owner and the Contractor, or the Contractor and the Subcontractor, specifying the part of the escrowed principal to be released from the escrow and to whom that portion is to be released. After receipt of the notice, the Escrow Agent shall remit the designated part of escrowed principal and the same proportion of then escrowed income.
3. The Escrow Agent shall be compensated for its services as the parties may agree in the amount not to exceed fifty percent (50%) of the escrowed income of the escrow amount.
4. See Section 9.10 - Final Completion and Final Payment, for provisions of retainage in escrow and final payment.

#### **9.9 PARTIAL OCCUPANCY OR USE**

- 9.9.1 DELETE the phrase "when such portion is designated by separate agreement with the Contractor" in line 2; DELETE the last two sentences in Subparagraph 9.9.1.

#### **9.10 FINAL COMPLETION AND FINAL PAYMENT**

- 9.10.1 ADD the following sentence at the end of the Subparagraph:

"Provided, however, that final payment shall not be due and payable until sixty-one (61) days after the Work has been completed and the Contract fully performed".

- 9.10.4 ADD the following at the end of Subparagraph 9.10.4:

"Final payment constituting the unpaid balance of the Contract Sum shall be paid to the Contractor in full, including any retainage *or escrowed principal and escrowed income by the escrow agent*, no less than sixty-one (61 days) following the date of substantial completion. If at any of that time there are any remaining uncompleted items, an amount equal to two hundred percent (200%) of the value of each item as determined by the Architect shall be withheld until said items are completed and a Final Certificate of Payment is issued by the Architect".

DELETE Subparagraph 9.10.5 in its entirety and replace with the following:

- 9.10.5 The Contractor's obligation to perform the Work and complete the Project in accordance with the Contract Documents shall be absolute. Neither approval of any progress or final payment, nor the issuance of a Certificate of Substantial Completion, nor any payment by the Owner to the Contractor under the Contract Documents, nor any use or occupancy of the Project or any part thereof by the Owner, nor any act of acceptance by the Owner shall constitute an acceptance of Work not in accordance with the Contract Documents, nor does it constitute a waiver of any claims that arise from: (1) liens, claims, security interests or encumbrances arising out of the contract or settled; or (2) terms of any warranties in favor of the Owner that are provided pursuant to the Contract Documents or otherwise.

#### **ARTICLE 10 - PROTECTION OF PERSONS AND PROPERTY**

DELETE Subparagraph 10.1 in its entirety and replace with the following:

- 10.1 The Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work and in connection with the Contractor's performance of any work other than the Work.

## **10.2 SAFETY OF PERSONS AND PROPERTY**

10.2.1 REPLACE the words "reasonable" with the phrase "all necessary" in both instances in line 1.

ADD the following to Subparagraph 10.2.1:

- .4 Protect excavation, trenches, buildings and grounds from all water damage. Furnish necessary equipment to provide this protection during the term of the Contract. Construct and maintain necessary temporary drainage to keep excavations free of water.
- .5 Provide protection of the Work against wind, storms, cold and heat. At the end of each day, cover new Work which may be damaged;
- .6 Provide adequately-engineered shoring and bracing required for safety and for the proper execution of the Work and have same removed when the Work is completed; and
- .7 Protect, maintain and restore benchmarks, monuments and other reference points affected by the Work. If benchmarks, monuments or other reference points are displaced or destroyed, points shall be re-established and markers reset under the supervision of a licensed surveyor, who shall furnish certificates of its work.

10.2.5 INSERT the work "solely" after the word "loss" in the clause which reads "except damage or loss attributable to acts or omissions of the Owner or Architect...".

ADD the following new Subparagraphs 10.2.9, 10.2.10 and 10.2.11:

- 10.2.9 "The Project is designed to be self-supporting and stable after the Work is fully completed. Except as otherwise provided, it is solely the Contractor's responsibility to determine erection procedures and sequences, and to ensure the safety of the Project and its component parts during erection. This includes, but is not limited to, the addition or modification of whatever temporary bracing, guys or tie downs may be necessary. Such material shall be removed after completion of the Work".
- 10.2.10 The Contractor shall conform with the United States Department of Labor and the State Division of Labor Occupational Safety and Health Administration regulations.
- 10.2.11 The Contractor shall have the Hazard Communication Program in effect with all their personnel working on the project. All Material Data sheets should be current as required by law.

## **ARTICLE 11 - INSURANCE AND BONDS**

### **11.1 CONTRACTOR'S INSURANCE AND BONDS**

11.1.1 ADD the following at the end of the subparagraph:

- .1 The form of such bonds shall be acceptable to Owner and in compliance with **Indiana** Statute:
- .2 The Bonds shall remain in effect for a period of not less than one (1) year following the date of Substantial Completion and/or time required to resolve any items of incomplete Work and the payment to any owed amounts, whichever time period extends the longer.
- .3 The amount of the Performance Bond and the Labor and Material Bond shall each be 100% of the Contract Sum; and
- .4 The Contractor shall require the attorney in fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of his power of attorney indicating the momentary limit of such power.
- .5 The required insurance shall be written for not less than the limits stated in the Owner's Instructions to the Architect (AIA Document G612, Part B) as included in the Project Manual or as required by law, whichever is greater and with the Owner, Architect, Consultants, and Engineers or their

assigned names as "Additional Insureds" "Primary" on the insurance policy. Coverages shall be maintained without interruptions from date of commencement, of the work, until date of final payment and termination of any coverage required to be maintained after final payment.

Add the following new Subparagraph 11.1.5 and 11.1.6:

11.1.5 The Contractor shall furnish one copy of Certificate of Insurance and Bonds required of each copy of the agreement, which shall specifically set forth evidence of all coverages required. Furnish Owner copies of any endorsements subsequently issued amending coverage limits.

11.1.6 The Contractor shall keep the surety informed of the progress of the Work, changes in the Work, requests for release of retainage, request for final payment and any other information required by the surety.

## **11.2 OWNER'S INSURANCE**

11.2.1.1 Any errors and omissions insurance maintained by the Architect or the Architect's Consultants shall not serve to exclude the Architect or Architect's Consultant from the mutual waiver of rights outlined in paragraph 11.3.7. The waiver of rights is given in exchange for property insurance covering the work.

11.2.2 Change the second sentence to include after sub-subcontractors: "...and Architects and Engineers of Record".

## **ARTICLE 13 – MISCELLANEOUS PROVISIONS**

### **13.2 SUCCESSORS AND ASSIGNS**

13.2.1 DELETE the last two sentences of this Subparagraph.  
ADD the following as the last two sentences of the Subparagraph:

"Contractor shall not assign the Contract or any portion thereof without the written consent of Owner. Owner is entitled to assign the Contract or any portion thereof".

13.2.2 DELETE this Subparagraph in its entirety.

### **13.4 TESTS AND INSPECTIONS**

13.4.7 ADD the following new Subparagraph:

Neither the observations of the Architect, its administration of the Contract Documents, nor inspections tests or approvals by persons other than the Contractor shall relieve the Contractor from its obligation to perform the Work in accordance with the Contract Documents.

13.6 ADD the following new Paragraph:

The Owner will require the Contractor to conduct a background check for criminal history for all workers on the project in compliance with Indiana Code 20-5-2-7 and 20-5-2-8.

"The Contractor shall provide, if awarded the right to provide services or materials under this agreement, a list of all personnel used by or on behalf of the Contractor, whether employed by them or not, who will be engaged in the providing of services or delivery of materials and goods.

With said list of persons shall be provided written evidence of a criminal record search with respect to all persons on the list dated within thirty (30) days of the said date of the Contract and extending at least twenty (20) years prior.

Contractor agrees that no person will be providing services who has any criminal conviction for any type of behavior that would place the students or staff at risk.

If evidence of such behavior occurs after this initial search, but during their employment on site, such worker shall be removed immediately from the site and shall be banned from the jobsite for the duration of the project.

Evidence of behavior that is prohibited would include, but not limited to, the following:

- (1) Murder [IC 34-42-1-1].
- (2) Causing suicide [IC 35-42-1-2].
- (3) Assisting suicide [IC 35-42-1-2.5].
- (4) Voluntary manslaughter [IC 35-42-1-3].
- (5) Reckless homicide [IC 35-42-1-5].
- (6) Battery [IC 35-42-2-1] unless ten (10) years have elapsed from the date the individual was discharged from probation, imprisonment, or parole, whichever is later.
- (7) Aggravated battery [IC 35-42-2-1.5].
- (8) Kidnapping [IC 35-42-3-2].
- (9) Criminal confinement [IC 35-42-3-3].
- (10) A sex offense under ([C 35-42-4].
- (11) Carjacking [IC 35-42-5-2].
- (12) Arson [IC 35-43-1-1] unless ten (10) years have elapsed from the date the individual was discharged from probation, imprisonment, or parole, whichever is later.
- (13) Incest [IC 35-46-1-3].
- (14) Neglect of a dependent [IC 35-46-1-4(a)(1) and IC 35-46-1-4(a)(2)] unless ten (10) years have elapsed from the date the individual was discharged from probation, imprisonment, or parole, whichever is later.
- (15) Child selling [IC 35-46-1-4(b)].
- (16) Contributing to the delinquency of a minor [IC 35-46-1-8] unless ten (10) years have elapsed from the date the individual was discharged from probation, imprisonment, or parole, whichever is later.
- (17) An offense involving a weapon under IC 35-47 unless ten (10) years have elapsed from the date the individual was discharged from probation, imprisonment, or parole, whichever is later.
- (18) An offense relating to controlling substances under IC 35-48-4 unless ten (10) years have elapsed from the date the individual was discharged from probation, imprisonment, or parole, whichever is later.
- (19) An offense relating to material or a performance that is harmful to minors or obscene under IC 35-49-3 unless ten (10) years have elapsed from the date the individual was discharged from probation, imprisonment, or parole, whichever is later.
- (20) An offense relating to operating a motor vehicle while intoxicated under IC 9-30-5 unless five (5) years have elapsed from the date the individual was discharged from probation, imprisonment, or parole, whichever is later.
- (21) An offense that is substantial equivalent to any of the offenses listed in this subsection in which the judgment of conviction was entered under the law of any other jurisdiction. Should the Contractor change personnel during the existence of the Contract providing for services, it shall at least ten (10) days prior to using any other personnel other than those previously disclosed, provide the same information for the new personnel as provided for under the terms of the provision."



13.7 ADD the following new Paragraph:

The Owner will require the Contractor to conduct testing for drugs and alcohol for all workers on the project. Drugs and alcohol shall be as defined by Indiana Code 35-48-4-4.

"The Contractor shall provide, if awarded the right to provide services or materials under this agreement, a list of all personnel used by or on behalf of the Contractor, whether employed by them or not, who will be engaged in the providing of services or delivery of materials and goods.

With said list of persons shall be provided written evidence of drug and alcohol testing with respect to all persons on the list dated within seven (7) days of the said date of the Contract.

Contractor agrees that no person will be providing services who has tested positive to any of the items included and shall be banned from the jobsite for the duration of the project.

Continued testing shall be conducted throughout the project duration every six months maximum. Any persons testing positive shall be removed immediately from the site and shall be banned from the jobsite for the duration of the project.

The Contractors and their employees shall meet all State and Federal statutory requirements".

13.8 ADD the following new Paragraph:

The Contractor and all its subcontractors are required to comply with all provisions of Indiana Code 22-5-1.7 to affirm that it does not knowingly employ or contract with an unauthorized alien or retain an employee or contract with a person that they subsequently learn is an unauthorized alien.

The Contractor is required to enroll in and verify the work eligibility status of all newly hired employees of the contractor through the E-Verify program as defined in IC 22-5-1.7-3.

The Contractor is not required to verify the work eligibility status of all newly hired employees of the contractor through the E-Verify program if the E-Verify program no longer exists and the Contractor signs an affidavit affirming that the Contractor does not knowingly employ an unauthorized alien.

13.9 ADD the following new Paragraph:

There shall be no firearms allowed on the project site or anywhere within the project property.

Exceptions would be made for law enforcement officials, security forces required elsewhere by these Specifications, or per other requirements or allowances specifically made by the Owner.

13.10 ADD the following new Paragraph:

There shall be no smoking or tobacco use allowed within the buildings, on the project site or anywhere within the project property. Violators shall be removed from the project immediately.

Any construction materials in contact with or exposure to such tobacco products shall be removed and replaced with new, at the Contractor's expense.

Additional requirements and levels of protection are afforded to Public Buildings in compliance with Indiana Code 16-41-37, and include an enclosed structure or part of an enclosed structure that is one of the following:

- (1) Occupied by an agency of state or local government.
- (2) Used as a classroom building or a dining area at a state educational institution (as defined in IC 20-12-0.5-1).
- (3) Used as a public school (as defined in IC 20-18-2-15).
- (4) Licensed as a health facility under IC 16-21 or IC 16-28.
- (5) Used as a station for paid firefighters.
- (6) Used as a station for paid police officers.
- (7) Licensed as a childcare center or child care home or registered as a child care ministry under IC 12-17.2.
- (8) Licensed as a hospital under IC 16-21 or a county hospital subject to IC 16-22.
- (9) Used as a provider's office.
- (10) School bus (as defined in IC 16-41-37-2.3).

#### **ARTICLE 14 - TERMINATION OR SUSPENSION OF THE CONTRACT**

##### **14.1 TERMINATION BY THE CONTRACTOR**

DELETE Subparagraph 14.1.1 in its entirety and replace with the following:

- 14.1.1 If the Work is stopped for a period of sixty (60) days under an order of any court or other public authority having jurisdiction, or as a result of any act of government such as a declaration of a national emergency making material unavailable, through no act or failure to act of the Contractor or a Subcontractor or their agents or employees or any other persons performing any of the Work under a contract with the Contractor, and the Owner has not otherwise suspended, delayed, disrupted or interrupted the Work in accordance with the Subparagraph, then the Contractor may, upon fourteen (14) days' written notice to the Owner, terminate the Contract, and recover from the Owner payment for all Work executed to date. Recovery by the Contractor of lost anticipated profit and overhead and other consequential and incidental damages is hereby specifically excluded.

- 14.1.3 DELETE all words following the words "payment for" and ADD the following after "payment for":

"all work executed to date. Recovery by the Contractor of last anticipated profit and overhead and other consequential and incidental damages is hereby excluded."

ADD the following new Subparagraph 14.1.5:

- 14.1.5 "The Owner shall not be liable to the Contractor for the Owner's failure to perform its obligations set forth herein if such performance is prevented or interrupted by war (including the consequences thereof), fire, tornado, hurricane, windstorms, labor problems, fuel or transportation shortages, civil unrest, governmental action, or any other natural or economic disaster or cause which is reasonably beyond the control of the Owner ("Force Majeure"). If the estimated duration of the Force Majeure is one year or more, the Contractor shall have the option to terminate this Contract upon thirty (30) days' written notice. In the event that the estimated duration of the Force Majeure is less than one year, the Contract Time shall be increased by the same length of time as the Force Majeure persisted."

##### **14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE**

- 14.3.1 DELETE this Subparagraph in its entirety.

- 14.3.2 DELETE this Subparagraph in its entirety.

**14.4 TERMINATION BY THE OWNER FOR CONVENIENCE**

DELETE Subparagraph 14.4.3 in its entirety and substitute the following:

- 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; reimbursable costs actually incurred, including costs attributed to termination of Subcontracts; and an amount representing six percent (6%) of the amount of the work not executed".

**ARTICLE 16 - EQUAL OPPORTUNITY**

- 16 ADD this new Article 16, including Paragraphs and Subparagraphs as follows:

**16.1 POLICIES OF EMPLOYMENT**

- 16.1.1 The Contractor and the Subcontractor shall not discriminate against any employee or applicant for employment because of race, religion, color, age, sex or national origin, in connection with, but not limited to employment, upgrading, demotion, transfer, recruitment or recruitment advertising, layoff or termination, rates or pay or other forms of compensation and selection for training including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth its policies of non-discrimination consistent with this Article.

END OF SECTION 00 73 01

SECTION 00 73 16 – INSURANCE REQUIREMENTS

1.01 PROJECT MANUAL

All requirements of the Project Manual shall apply to this Section.

1.02 MINIMUM INSURANCE COVERAGES

A. Workmen's Compensation - statutory.

1. Employer's Liability - \$100,000.

B. Comprehensive General Liability (including Premises - Operations, Independent Contractor's Protective, Products and Completed Operations, Broad Form Property Damage):

- a. Bodily Injury:  
\$1,000,000 - one person aggregate per project endorsement. CG2503 to be included  
\$2,000,000 - annual aggregate.
- b. Property Damage:  
\$1,000,000 - each occurrence.  
\$2,000,000 - annual aggregate.
- c. Property Damage Liability Insurance shall include coverage for the following hazards: X (Explosion), C (Collapse), U (Underground).
- d. Waiver of subrogation to be included
- e. Additional insured form CG2010 to be included

C. Contractual Liability (Hold Harmless Coverage).

- a. Bodily Injury:  
\$2,000,000 each occurrence
- b. Property Damage:  
\$1,000,000 each occurrence  
\$2,000,000 aggregate

- D. Personal Injury, with employment exclusion deleted:  
\$1,000,000.

E. Comprehensive Automobile Liability (Owned, Non-Owned, Hired):

- a. Bodily Injury:  
\$1,000,000 each person.  
\$1,000,000 each accident
- b. Property Damage:  
\$500,000 each occurrence.
- c. Owner to be named as additional insured and provided a Waiver of Subrogation.

F. Catastrophic Umbrella Coverage, including products - complete operations:  
\$2,000,000

G. Prime Contractors and all subcontractor's insurance shall be primary and non-contributory on all insurance.

END OF SECTION 00 73 16

SECTION 01 11 00 - SUMMARY OF WORK – SINGLE CONTRACT

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Section Includes:
  - 1. Work covered by the Contract Documents.
  - 2. Contractor's use of premises.
  - 3. Coordination of work and trades.
  - 4. Owner occupancy during construction.
  - 5. Partial occupancy of completed work.
  - 6. Construction scheduling and phasing.
  
- B. Project is being bid with construction work under one General Contract for all trades.

1.02 WORK COVERED BY CONTRACT DOCUMENTS

- A. Provide and pay for all materials, labor, services, equipment, licenses, permits, fees, taxes, and other items necessary for the execution, installation and completion of Work indicated in Contract Documents.
  
- B. The Work includes coordination with Architect, Owner's Representative, Owner's separate contractors, material suppliers and vendors.

1.03 CONTRACTOR'S USE OF PREMISES

- A. Contractor shall limit his use of premises for work and storage, to allow for Owner's occupancy as identified in this Section.
  
- B. Assume full responsibility for protection and safekeeping of products stored on premises.
  - 1. Move any stored products that interfere with operations of Owner or other Contractor.
  - 2. Obtain and pay for use of additional storage or work areas needed for operations.
  - 3. Available space for construction field offices and storage sheds is limited to the project site. Contractor must arrange for off site storage as required.
  
- C. Contractor shall allow for any other work outside of this contract, whether by Owner's personnel or Contractors under Owner's separate contracts, to proceed without delay or impediment.

1.04 COORDINATION

- A. Schedule, manage and expedite all work under his Contract, coordinating his work with his sub-contractors, material suppliers, vendors, and trades so that no conflicts of timing or location occur.
  - 1. Work shall progress according to approved progress schedule.  
Schedule dates for incorporation of work, and identify all critical path events and dates.
  - 2. Coordinate and provide all floor, ceiling, roof, and wall sleeves.
  - 3. Provide all cutting, fitting or patching required.
  
- B. Keep Architect informed on the progress of the work.
  - 1. Close or cover no work until duly inspected and approved.
  - 2. Uncover un-inspected work and after approval, repair and/or replace all work at no cost to Owner.
  - 3. Notify Architect at least 7 days in advance of utility connections, utility shut-offs, mechanical equipment and oil line cutovers, street or alley closings to allow ample time to receive Owner's written approval of procedure to be followed.
  - 4. Coordinate all operations with the Architect and Owner. Complete in the minimum amount of time.

- C. Protection:
  - 1. Do not close or obstruct streets, entrance drives, sidewalks or other facilities without permission of the Owner and local authorities.
  - 2. Conduct operations with minimum interference.
  - 3. Furnish, erect and maintain barricades, warning lights, signs and guards as may be required.

1.05 OWNER OCCUPANCY

- A. Owner will occupy premises during entire period of construction for the conduct of their daily activities and operations.
- B. Cooperate with Owner or his representative in all construction operations to minimize conflict and to facilitate Owner's usage of building.
- C. Conduct construction operations to assure least inconvenience to Owner and public.
- D. Provide temporary heating and ventilation, temporary dust partitions, plastic sheeting, plywood sheeting, and any other means required to protect all elements of existing building from damage or deterioration during construction.

1.06 PARTIAL OCCUPANCY

- A. Prior to occupancy, execute Certificate of Substantial Completion for designated area.
- B. Contractor provide: Access for Owner's personnel.
- C. Owner provides, upon occupancy:
  - 1. Maintenance
  - 2. Operation of HVAC, electrical systems.
  - 3. Security.

1.08 CONSTRUCTION SCHEDULING AND PHASING

- A. Owner intends to award the Contract on May 13, 2024.
- B. Contractor shall mobilize on site and begin work immediately thereafter.
- C. **Contractor must achieve Substantial Completion by August 1, 2024**
- D. **Contractor must achieve Final Completion by September 1, 2024.**

END OF SECTION 01 11 00

SECTION 01 14 00 - GENERAL CONSTRUCTION REQUIREMENTS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Section Includes:
1. Special Provisions.
  2. Commencement Activity.
  3. Quality Control.
  4. Pre-final and Final/Occupancy Inspections
  5. Project Closeout.

1.02 SPECIAL PROVISIONS

- A. Project:  
The Project is the total construction for which the Contractor is responsible, including all labor, materials and equipment used or incorporated in such construction.
- B. Work:  
The Work comprises the completed construction designed under the Project and includes labor necessary to produce such construction, and materials and equipment to be incorporated in such construction.
- C. Contract Documents includes the following (See General Conditions 1.1.1 for definition):
1. Project Manual. (See General Conditions 1.1.7 for definition) The Project Manual is composed of the following:
    - a. The Bidding Requirements.
    - b. The Contract Forms.
    - c. The Conditions of the Contract.
    - d. The Specifications. (See General Conditions 1.1.6 for definition)
  2. Drawings (See General Conditions 1.1.5 for definition)
  3. Addenda (See Instructions to Bidders 1.3 for definition)
  4. Other Documents as identified in the Contract for Construction, the General Conditions of the Contract for Construction, and Supplementary General Conditions
- D. Demolition:  
All existing Improvements on the site indicated on the Drawings to be demolished, shall be removed by Contractor. Use such methods as required to complete the work in compliance with all governing authorities and utility company requirements. All existing utility connections shall be disconnected, properly capped and removed by the Contractor. Complete removal of existing foundation walls or footings is required under new construction or other new foundations. Remove all below-grade wood and metal. Any existing basements, cisterns and/or other below grade voids shall be filled with compatible fill material suitable for proposed constructions and compacted per specific requirements. Completely remove cisterns located under new construction. All debris, rubbish, salvage and other materials shall be removed from the site. Protect all adjacent properties and structures, and existing buildings from damage.
- E. Utilities:  
It is the Contractor's responsibility to coordinate with the appropriate utility companies actual location of mains serving the site and route the building utility lines in the most direct route.
1. The location of utilities existing in the building as indicated on the Drawings may be modified by the Contractor to accommodate a more direct route to the utility connection location with written approval from Architect.



F. Permits and Fees:

The Contractor is responsible for verifying any and all fees required from all utilities, agencies and authorities having jurisdiction. The Contractor shall obtain and pay for the Building Permit and all other permits and governmental fees, licenses and inspections required, whether specifically referenced or not. The Contractor is to include in the bid the cost of all charges payable to State, local or special community development agencies and any additional fees as required for the completion of the project, including, but not limited to:

1. Water company connection fees and charges
2. Electrical company charges.
3. Telephone company charges.
4. Sanitary sewer connection fees and charges.
5. Gas Company charges.
6. Fire sprinkler connection fees and charges.

G. Historical and Archeological Finds: All items having any apparent historical or archeological interest discovered in the course of construction must be carefully preserved. The Contractor must leave the archeological find undisturbed and immediately report it to the Architect. Work on the project may be stopped until such find is analyzed, inspected and removed by the Governing Authority.

1.03 COMMENCEMENT ACTIVITY

A. Evidence that the Contractor has started procurement of materials, preparation and submission of shop drawings, preparation of subcontracts and other preparatory work must satisfy the requirement that work began upon receipt of Notice to Proceed.

1.04 QUALITY CONTROL

A. Testing:

1. Employ the services of an independent testing laboratory to take samples, perform tests and make inspections. The costs for such laboratory and tests shall be borne by the Contractor.
2. Submit testing reports as per Architect.
3. Refer to Section 01 45 00-Quality Control for additional requirements.

1.05 PRE-FINAL AND FINAL/OCCUPANCY INSPECTIONS

A. The Contractor is to notify in writing, the Architect, that the work is complete for a Pre-Final Inspection (also referred to as "Final Punchlist Inspection". The Contractor must provide the Architect at least 10 calendar days advance notice.

B. The Contractor is to diligently complete all punchlist items before a Final/Occupancy Inspection is scheduled.

1.06 PROJECT CLOSEOUT

A. Cleaning during construction:

1. The premises and the job site shall be maintained in a reasonable neat and orderly condition and kept free from accumulations of waste materials and rubbish during the entire construction period. Remove crates, cartons, and other flammable waste materials or trash from the work areas at the end of each working day. Do not allow debris to blow onto adjoining properties. Respond immediately to request from adjoining property owners to remove any debris that does manage to show up on adjoining properties.
2. Maintain the project in clean condition until the Owner accepts the building.
3. Refer to Section 01 74 23 - Cleaning for additional requirements.

B. Closeout Procedures:

Refer to Section 01 77 00 - Closeout Procedures for additional requirements.

C. Closeout Submittals:

1. Before the project can be closed out, the Contractor shall have provided all submittals required by the Contract Documents. All submittals required by the Contract Drawings or Specifications shall be sent to the Architect for review and coordination, in accordance with the requirements of the respective Drawing or Specification section. Any items that the Architect determines are incomplete or incorrect shall be corrected and resubmitted.
2. Refer to Section 01 78 00 - Closeout Submittals for additional requirements.
3. Refer to Section 01 78 46 - Closeout Maintenance Materials for additional requirements.

D. Retainage:

1. The Architect will assign a monetary value to all punchlist items not completed, and to all required submittals not received, as of the date of "Final Acceptance" and an amount equal to 200 percent of the total value of those items shall be retained and/or deducted from the Contractor's final payment until the Contractor demonstrates to the Architect's satisfaction that such items have been completed or corrected. Refer to the General Conditions and Supplementary General Conditions for additional information regarding retainage.

END OF SECTION 01 14 00

SECTION 01 21 16 - CONTINGENCY ALLOWANCE

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Section Includes:  
1. Contingency Allowance in Contract Sum.

1.02 CONTINGENCY ALLOWANCE

- A. Allow a lump sum fee of **\$100,000**
- B. To be included in the Base Bid of Contract.
- C. Itemize Contingency Allowance on Application and Certificate for Payment and Schedule of Values.
- D. Contingency Allowance to be used for unforeseen conditions encountered during the work.
- E. Do not include any contractor's additional costs in bid.  
Adjustments to contingency allowance will include labor, material, transportation, overhead and profit.  
All costs for these items to be included in all proposals to Architect for adjustments to contract.
- F. Use Funds in Contingency Allowance only on written agreement between Owner, Architect and Contractor.
- G. All Proposals shall be authorized by the Architect prior to execution and recorded in Contractor's as-builts and Architect's project Record Documents.
- H. Adjustment to Allowances will be made by Change Order.  
Any unused amounts to be credited back to the Owner.

END OF SECTION 01 21 16

SECTION 01 29 73 - SCHEDULE OF VALUES

1.01 REQUIREMENTS INCLUDES

- A. Section Includes:
1. General Requirements.
  2. Format and Content.

1.02 GENERAL REQUIREMENTS

- A. Submit to the Architect/Engineer a Schedule of Values allocated to the various portions of the Work.
- B. Upon request of the Architect/Engineer, support the values with data which will substantiate their correctness.
- C. The Schedule of Values, unless objected to by the Architect/Engineer, shall be used as the basis for the Contractor's Application and Certificate for Payment.

1.03 FORMAT AND CONTENT

- A. Type schedule on AIA Document G703, Continuation Sheet for Application and Certificate for Payment. Identify schedule with:
1. Title of Project as listed on cover of Project Manual
  2. Architect project number.
  3. Name and Address of Contractor.
  4. Contract Designation.
  5. Date of submission.
- B. Schedule shall list the installed value of the component parts of the Work in sufficient detail, as determined by the Architect, to serve as a basis for computing values for progress payments during construction.
1. Follow the table of contents of this Project manual as the format for listing component items.
  2. Identify each line item with the number and title of the respective major section of the specifications.
  3. Identify separate line items for all items for materials and labor.
  4. Identify further breakdown for any and all items as determined by the Architect.
- C. For Mechanical and Electrical Scope of Work, major products or operations are to be listed.
- D. For the various portions of the work:
1. Each item shall include a directly proportional amount of the contractor overhead and profit.
  2. For items on which progress payments will be requested for stored materials, break down the value into:
    - a. The cost of the materials, delivered and unloaded, with taxes paid.
    - b. The total installed value.
- E. The sum of all values listed in the schedule shall equal the total Contract Sum.

END OF SECTION 01 29 73

SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Section Includes:

1. Administrative and supervisory personnel.
2. Submittals.
3. Contractor quality control.
4. Coordination Drawings.
5. Project coordination.

B. Procedures for preparation, updating and submittal of Construction Progress Documentation.

1.02 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. Project Coordination Administrator: Contractor Representative experienced in administration, supervision, and quality control of building expansion and alteration construction, similar to Work of this Project, including mechanical and electrical work.

B. Project Field Superintendent:

1. Contractor Representative experienced in general field supervision of building construction, similar to Work of this Project, including mechanical and electrical work, to supervise, direct, inspect and coordinate Work of Contractor, subcontractors, suppliers and installers, and expedite Work to assure compliance with Construction Schedules.
2. Superintendent must read, write, and speak English fluently.
3. Superintendent must be present at the Project site whenever work is being performed. Superintendent must remain on the Project from Notice to Proceed to Substantial Completion. Do not change personnel without written permission from the Owner.

1.03 SUBMITTALS

A. Submit list of Contractor's principal staff assignments, including Project Coordination Administrator, Project Field Superintendent, Quality Control Representative, and other personnel in attendance at site; identify their duties and responsibilities.

B. Submit all items for execution of Contract as listed in Section 00 43 93 – Contractor's Bid Submittal checklist.

C. Submit shop drawings, product data, and other required submittals, in accordance with Section 01 33 00 - Submittal Procedures, for review and compliance with Contract Documents, for field dimensions and clearances, for relation to available space, and for relation to Work by Owner or separate Contracts.

D. Submit Requests for Information and interpretation of Contract Documents in a timely manner and obtain replies from Architect in accordance with the Contract.

1.04 CONTRACTOR QUALITY CONTROL

A. Perform project quality control in accordance with requirements in the Contract.

B. Coordinate scheduling of inspection and testing required by individual specification Sections and in accordance with Section 01 45 00 - Quality Control.

1.05 COORDINATION DRAWINGS

- A. Prepare and distribute coordination drawings where close coordination is required for installation of Products and materials fabricated off-site by separate entities, and where limited space availability requires maximum utilization of space for efficient installation of different components. Show interrelationship of components shown on separate shop drawings. Indicate required installation sequences.

1.06 PROJECT COORDINATION

- A. Coordinate construction activities and work of all trades under various Sections of these Specifications and Work of Contract to facilitate orderly installation of each part of Work. Coordinate construction operations included under different Sections of Specifications and Contract that are dependent upon each other for proper installation, connection, and operation.
- B. Where installation of one part of Work is dependent on installation of other components, either before or after that part of Work, schedule construction activities in sequence required to obtain uninterrupted installation.
- C. Obtain drawings, manufacturer's product data, instructions, and other data to provide a complete and proper installation.
  - 1. Check field dimensions prior to installing products.  
Verify necessary clearances and means of access from equipment storage to final position.
  - 2. Make data and information available to trades involved.
- D. Ensure that utility requirements of operating equipment are compatible with building utilities. Coordinate Work of various specification Sections for installation and final connection of equipment.
  - 1. Assure that mechanical, plumbing, and electrical rough-ins have been properly located.
- E. Coordinate space requirements and installation of mechanical, plumbing, and electrical Work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, conduits, and wiring, as closely as possible; make runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- F. Where availability of space is limited, coordinate installation of different components to ensure maximum accessibility for required maintenance, service, and repair.
- G. Provide for installation of items scheduled for future installation.
- H. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Prepare memoranda for Architect and separate contractors where coordination of their work is required.
- I. In finished areas, conceal pipes, ducts, conduits, and wiring in the construction. Coordinate locations of fixtures and outlets with finish elements.
- J. Coordinate completion and clean up of Work of separate Sections in preparation for completion of work per the Contract.
- K. After Owner occupancy of Project, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize to Owner.

END OF SECTION 01 31 00

SECTION 01 31 19 - PROJECT MEETINGS

PART 1 – GENERAL

1.01 REQUIREMENTS INCLUDED

A. Section Includes:

1. Contractor participation in pre-bid conference, pre-construction conferences, progress meetings, and pre-installation meetings.
2. Architect shall schedule and chair Project Meetings and prepare summary minutes for distribution by Contractor to all in attendance.

1.02 PRE-BID CONFERENCE

A. Architect will administer pre-bid conference to provide further understanding of Scope of Work.

B. Attendance:

1. Architect.
2. All prospective bidding Contractors, Subcontractors, Suppliers and Vendors.
3. Attendance is not required, but strongly encouraged.

C. Agenda:

1. Review Notice-to-Bidders.
2. Review Bid Requirements and Contractor's Bid Submittal Checklist.
3. Review Summary of Work.
4. Review Construction Document set.
5. Review Project Site (if necessary).
6. Questions and Answers.

D. Architect will notify all bidders as to time and place of Pre-Bid Conference.

1.03 PRE-CONSTRUCTION CONFERENCES

A. Architect will administer pre-construction conference.

B. Attendance:

1. Architect.
2. Owner's Representative.
3. Contractor's Project Manager.
4. Contractor's Job Superintendent.

C. Agenda:

1. Execution of Owner-Contractor Agreement.
2. Exchange of preliminary submittals.
3. Submission of executed bonds and insurance certificates.
4. Distribution of Contract Documents.
5. Submission of Schedule of Values. (If not required before hand).
6. Designation of personnel representing the parties in Contract.
7. Procedures and processing of Requests for Information, field decisions, submittals, substitutions, Applications for Payment, proposal requests, Change Orders, and contract closeout procedures.
8. Scheduling.
9. Construction facilities and temporary controls.
10. Notice to Proceed.



- D. Architect will record minutes and distribute copies to Contractor and Owner and those affected by decisions made. Contractor is responsible for distribution of copies to Subcontractors, Suppliers and Vendors.
- E. Architect will administer mobilization conference at Project site for clarification of Contractor responsibilities in use of site and for review of administrative procedures.

1.04 PROGRESS MEETINGS

- A. Architect shall schedule and administer Project Meetings throughout progress of the Work not less frequently than every month. Additional Project Meetings shall be scheduled as appropriate to construction activity.
- B. Attendance:
  - 1. Architect.
  - 2. Owner's Representative.
  - 3. Contractor's Project Manager.
  - 4. Contractor's Job Superintendent.
  - 5. Major Subcontractors and Suppliers.
  - 6. Contractor's Quality Control Representative.
  - 7. Others as appropriate to agenda topics.
- C. Agenda:
  - 1. Review of and corrections to minutes of previous meetings.
  - 2. Review of Work progress and/or payment progress.
  - 3. Field observations, problems, and decisions.
  - 4. Identification of problems which impede planned progress.
  - 5. Review of submittals schedule and status of submittals.
  - 6. Review of off-site fabrication and delivery schedules.
  - 7. Maintenance of progress schedule.
  - 8. Corrective measures to regain projected schedules.
  - 9. Planned progress during succeeding work period.
  - 10. Coordination of projected progress.
  - 11. Maintenance of quality and work standards.
  - 12. Effect of proposed changes on progress schedule and coordination.
  - 13. Status of pending changes and substitutions.
  - 14. Other business relating to Work.
  - 15. Review of Construction Progress Documentation.
- D. Architect will record minutes and distribute copies to Owner and Contractor. Contractor shall distribute copies to all others.
- E. Contractor shall hold separate meetings with workers, sub-contractors and suppliers to coordinate means and methods of construction, and jobsite safety. Do not use Owner/Architect Progress Meetings for such purpose.

1.05 PRE-INSTALLATION MEETINGS

- A. When required in individual specification sections or as determined necessary by Architect, convene a pre-installation meeting at work site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect seven days in advance of meeting date.

- D. Prepare agenda and preside at meeting:
  - 1. Review conditions of installation, preparation and installation procedures.
  - 2. Review coordination with related work.
  - 3. Agenda items listed in individual specification Sections.
  - 4. Installation schedule.
  
- E. Architect will record minutes and distribute copies to participants, and those affected by decisions made.

END OF SECTION 01 31 19

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Section Includes:

1. Construction Progress Schedule.
2. Contractor as-built drawings.
3. Provisions for format, content, revisions, submittals and distribution.

1.02 CONSTRUCTION PROGRESS SCHEDULE

A. Format:

1. Prepare Schedules as horizontal bar chart with separate bar for each major portion of Work or operation, identifying first work day of each week.
2. Sequence of Listings: The Table of Contents of this Project Manual.
3. Form: Contractor's option.

B. Content:

1. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
2. Identify each item by major Specification section number.
3. Provide sub-schedules to define critical portions of entire Schedule.
4. Show accumulated percentage of completion of each item, and total percentage of Work completed, to correspond with Application for Payment. Percentage of completion shall not include stored materials.
5. Provide separate schedule of submittal dates for shop drawings, product data, and samples and dates reviewed submittals will be required from Architect. Show dates for selection of finishes.
6. Show delivery dates for Owner furnished items, if any.
7. Coordinate content with Section 01 29 73 - Schedule of Values.

C. Revisions:

1. Indicate progress of each activity to date of submittal, and projected completion date of each activity.
2. Identify activities modified since previous submittal, major changes in scope and other identifiable changes.
3. Provide narrative report to define problem areas, anticipated delays and impact on Schedule. Report corrective action taken or proposed and its effect.

D. Submittals:

1. Submit initial Schedules immediately following Award of Contract. After review, revise data and immediately submit for re-review.
2. Submit up-dated Progress Schedules with each Application and Certificate for Payment.
3. An updated Progress Schedule is required for review/consideration for Application and Certificate for Payment.
4. Submit under transmittal letter.

E. Distribution:

1. Distribute copies of reviewed schedules to Architect job site file, subcontractors, suppliers and other concerned entities including separate contractors.
2. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in Schedules.

1.03 CONTRACTOR AS-BUILT DRAWINGS

A. Format:

1. Contractor's job superintendent to record as-built conditions onto a single set of project drawings for all trades included in scope of work.
2. As-built set to be kept on site at all times.
3. Documentation may be hand written in ink or pasted directly onto drawings.  
All information must be considered to be permanently affixed.

B. Content:

1. Include work of all trades included in scope of work.
2. Include all changes, errors, deviations, omissions, additions, clarifications and corrections.
3. Include any item installed in a location other than that shown on contract drawings.
4. Correct any inaccurate or altered dimension.

C. Revisions:

1. As-built drawings shall be updated daily with all work completed.
2. Contractor job superintendent to be responsible for subcontractor information on as-built drawings.

D. Submittals:

1. As-built drawings may be reviewed at progress meetings or periodically as requested by Architect to review entries to date.

E. Distribution:

1. As built drawings shall be given to Architect prior to release of final payment.
2. Refer to Section 01 78 00 - Closeout Submittals.

END OF SECTION 01 32 00

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Section Includes:
1. Submittal Schedule.
  2. Submittal Requirements.
  3. Shop Drawings.
  4. Electronic files provided by the Architect.
  5. Product Data.
  6. Samples.
  7. Manufacturer's Information.
  8. Review by Contractor and Architect.
  9. Re-submittals.
  10. Distribution.

1.02 SUBMITTAL SCHEDULE

- A. Submit to the Architect a schedule listing all submittals required for review as required in the individual specifications sections.
- B. List submittals by specification section as listed in the index.

1.03 SUBMITTAL REQUIREMENTS

- A. Formats:
1. Submit all drawings and technical data electronically in PDF format.
    - a. Furnish all submittals specified in all sections of the specifications.
    - b. Submit each section under a separate transmittal for clarity and ease of review.
    - c. Make a complete submittal for each section; do not issue multiple submittals per section.
    - d. Compile all sheets, drawings, and product data into a single electronic file for review.  
Do not submit multiple PDF files per sheet or item.
    - e. Identify manufacturer and subcontractor/supplier.
    - f. Submit Material and Safety Data Sheets for all products and materials.
    - g. Name each PDF file to match specifications title and number, matching that as listed in the project manual.
  2. Submit to Architect via Architect's project management website specific to this project.
  3. Submit actual samples for finishes, colors, and textures for approval via mail or hand delivery.
- B. Transmit submittals in accordance with approved Progress Schedule and in such sequence to avoid delay in the Work or work of other contracts.
- C. Apply Contractor's stamp, signed or initialed, certifying to review, verification of products, field dimensions and field construction criteria and coordination of information with requirements of Work and Contract Documents.
- D. Coordinate submittals into logical groupings to facilitate interrelation of the several items:
1. Finishes which involve Architect selections of colors, textures, or patterns.
  2. Associated items which require correlation for efficient function or for installation.

1.04 SHOP DRAWINGS

- A. Present in a clear thorough manner, drawn by professional draftsman.
- B. Identify project with title as shown on cover of Project Manual; identify each element of drawings by reference to sheet number and detail, schedule, or room number on Contract Documents.
- C. Identify field dimensions; show relation to adjacent or critical features of Work or products.
- D. Sheet Size:
  - 1. Minimum: 8-1/2 x 11 inches.
  - 2. Maximum: 30 x 42 inches.

1.05 ELECTRONIC FILES PROVIDED BY THE ARCHITECT

- A. Architect may make available, at no cost, base xref drawings in AutoCAD format for contractor's use in preparing shop drawings.
- B. AutoCAD version of electronic files will be the latest version being utilized in the Architect's office. The Architect has no obligation to provide electronic files in a format that may be an old, outdated, reduced or simplified version of that being utilized in the Architect's office.
- C. Electronic files are an instrument of the Architect's service, and are the property of the Architect.
- D. The use of the information contained in the electronic files is at the sole risk of the user.
- E. The use of the electronic files does not relinquish the contractor from responsibilities for site and field verification of spaces, construction, conditions, requirements, dimensions, etc.

1.06 PRODUCT DATA

- A. Submit only pages which are pertinent; mark each copy of standard printed data to identify pertinent products, referenced to Specification Section and Article number. Show reference standards, performance characteristics, and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions; and required clearances.
- B. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the Work. Delete information not applicable.
- C. Provide manufacturer's published catalog pages and industry cutsheets, with all items and options marked as appropriate to the project.

1.07 SAMPLES

- A. When finishes are specified on the Drawings, submit samples of the specified finish for approval.
- B. When finishes are not specified on the Drawings, submit full range of manufacturer's standard finishes, except when more restrictive requirements or price groups are specified, indicating colors, textures, and patterns, for Architect's selection.
- C. Submit samples to illustrate functional characteristics of products, including parts and attachments.
- D. Label each sample with identification required for transmittal letter.
- E. Submit number of samples specified in individual specifications sections but not less than three (3).

- F. Special circumstances may require additional samples for determination of acceptance, such as textures, patterns, colorways, etc. Provide sample in the quantity and/or size as required for this determination.  
Requirements to be determined solely by the Architect.  
All such samples will be returned to the Contractor, less those retained for Owner and Architect files.
- G. Samples for selection of finishes need to be submitted as actual samples of the actual colors, materials and textures for proper selection and review of available choices. Samples for finishes already selected as indicated in the Drawings may be color charts in lieu of actual samples, if acceptable to the Architect.
- H. All samples may be retained for Owner and Architect files.
- I. See individual Specification sections for additional information and requirements.

1.08 MANUFACTURER'S INFORMATION

- A. Manufacturer's instructions for storage, protection, preparation, assembly, installation, adjusting, balancing and finishing.
- B. Installation details, anchoring requirements or other information specifically required by manufacturer.
- C. Specific information or details required by Manufacturer to uphold warranty of product specified.

1.09 CONTRACTOR'S REVIEW

- A. Review submittals prior to transmittal; verify subcontractor's field measurements, field construction criteria, manufacturer's catalog numbers, and conformance of submittal with requirements of Contract Documents.
- B. Coordinate submittals with requirements of Work and of Contract Documents.
- C. Affix a stamp and sign each drawing, manufacturer's data, sample, etc. as follows:

<p>This submittal has been reviewed by (<i>Name of Contractor</i>) and approved with respect to the means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incidental thereto. (<i>Name of Contractor</i>) also warrants that this submittal complies with contract documents and comprises no variations or increase in contract price thereto.</p> <p>By:- _____</p> <p>Date: _____</p>
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- D. Notify Architect in writing at time of submittal, of any deviations from requirements of Contract Documents. Architect will neither accept incomplete submittals, nor those which in the Architect's opinion, have not been properly reviewed by the Contractor.
- E. Do not fabricate products or begin work which requires submittals until return of submittal with Architect acceptance.



- F. Submittals which have not been thoroughly reviewed by Contractor prior to being forwarded to Architect will be rejected and returned for review.

1.10 ARCHITECT'S REVIEW

- A. Architect will review shop drawings, product data, and samples and return submittals within a reasonable time frame for complete review and approval.
- B. Architect's review is for conformance with information given and design concept expressed in the Contract Documents. The review shall not constitute approval of safety precautions, or of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.
- C. Review of shop drawings does not authorize changes to the contract sum unless stated in a separate letter or change order.

1.11 RE-SUBMITTALS

- A. Make re-submittals under procedures specified for initial submittals; identify changes made since previous submittals.

1.12 DISTRIBUTION

- A. Duplicate and distribute reproductions of shop drawings, copies of product data, and samples, which bear Architect's stamp of approval, to job site file, Contractor's Record Documents file, sub-contractors, suppliers and other entities requiring information.

END OF SECTION 01 33 00

SECTION 01 42 00 - REFERENCES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Section Includes:
1. Specification format and content.
  2. Quality assurance.
  3. Reference standards.
  4. Abbreviations.

1.02 SPECIFICATION FORMAT AND CONTENT

- A. Specification Format:  
Specifications are organized into Divisions and Sections based on Construction Specifications Institute (CSI) Division format and Master Format numbering system.
- B. Specification Content:  
This Specification uses certain conventions in use of language and intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:
1. Abbreviated Language:  
Language used in Specifications and other Contract Documents is abbreviated type. Words and meanings shall be interpreted as appropriate. Words that are implied, but not stated shall be interpolated as the sense required. Singular words will be interpreted as plural and plural words interpreted as singular where applicable and context of Contract Documents so indicates.
  2. Imperative and streamlined language is used generally in Specifications. Requirements expressed in imperative mood are to be performed by Contractor. At certain locations in text, for clarity, subjective language is used to describe responsibilities that must be fulfilled indirectly by Contractor, or by others when so noted.
  3. The words "shall be" shall be included by inference wherever a colon (:) is used within a sentence or phrase.

1.03 QUALITY ASSURANCE

- A. For Products or workmanship specified by association, trade, or other consensus standards, comply with requirements of standard, except when more rigid requirements are specified or are required by applicable codes. Such standards are made a part of Contract Documents by reference.
- B. Conform to reference standard by date of issue current on original date of issue indicated on Contract Documents.
- C. Obtain copies of standards when required by Contract Documents.
- D. Maintain copy at Project Site during submittals, planning, and progress of specific Work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from the Architect before proceeding.
- F. The contractual relationship, duties, and responsibilities of the parties in Contract nor those of Architect shall not be altered from Contract Documents by mention or inference otherwise in any reference document.

1.04 REFERENCE STANDARDS

A. Conflicting Requirements:

Where compliance with two or more standards is specified, and the standards may establish different or conflicting requirements for minimum quantities or quality levels. Refer requirements that are different, but apparently equal, and uncertainties to Architect for decision before proceeding.

1. Minimum Quantity or Quality Levels:

Quantity or quality level shown or specified shall be the minimum provided or performed. Actual installation may comply exactly with minimum quantity or quality specified, or it may exceed minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum, as appropriate for context of requirements.

Refer uncertainties to Architect for decision before proceeding.

B. Copies of Standards:

Each entity engaged in construction on Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with Contract Documents.

1. Where copies of standards are needed for performance of a required construction activity, Contractor shall obtain copies directly from publication source.

1.05 ABBREVIATIONS

A. Abbreviations and Names:

Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in Specifications or other Contract Documents, they mean the recognized name of trade association, standards generating organization, authority having jurisdiction, or other entity applicable to context of text provision. Refer to "Encyclopedia of Associations," published by Gale Research Company, available in most libraries.

END OF SECTION 01 42 00

SECTION 01 45 00 - QUALITY CONTROL

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Section Includes:
1. General Requirements.
  2. Qualifications.
  3. Contractor Field Inspection and Testing.
  4. Contractor's Test and Inspection Reports.
  5. Non-Compliance Check-Off List.
  6. Completion and Inspection of Work.

1.02 QUALITY CONTROL PROCEDURES

- A. Monitor quality control over Contractor staff, subcontractors, suppliers, manufacturer's, products, services, site conditions, and workmanship.
- B. Comply fully with manufacturer's published instructions, including each step in sequence of installation.
- C. Should manufacturer's published instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Comply with specified standards as a minimum quality for Work, except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform Work by persons who are thoroughly qualified and trained in their respective trade, to produce workmanship of specified quality.
- F. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
- G. Perform tests required by governing authorities having jurisdiction and utilities having jurisdiction.

1.03 CONTRACTOR FIELD INSPECTION AND TESTING

- A. Contractor:  
Test and Inspect Work provided under this Contract to ensure Work is in compliance with Contract requirements. Required tests and inspections are indicated in each individual Specification Section.
- B. Preparatory Inspection:  
Performed prior to beginning Work and prior to beginning each segment of Work and includes:
1. Review of Contract requirements.
  2. Review of shop drawings and other submittal data after return and approval.
  3. Examination to assure materials and equipment conform to Contract requirements.
  4. Examination to assure required preliminary or preparatory Work is complete.
- C. Initial Inspection:  
Performed when representative portion of each segment of Work is completed and includes:
1. Performance of required tests.
  2. Quality of workmanship.
  3. Review for omissions or dimensional errors.
  4. Examination of products used, connections and supports.
  5. Approval or rejection of inspected segment of Work.

- D. Follow-Up Inspections:  
Performed daily, and more frequently as necessary, to assure non-complying Work has been corrected.
- E. Testing and Inspection:  
Perform testing and inspection in accordance with requirements in individual Sections.

1.04 CONTRACTOR'S TEST AND INSPECTION REPORTS

- A. Prepare and submit, to Architect, a written report of each test or inspection signed by Contractor Quality Control Representative performing inspection within two (2) days following day inspection was made.
- B. Include the following on written reports of inspection:
  - 1. Cover sheet prominently identifying that inspection "CONFORMS" or "DOES NOT CONFORM" to Contract Documents.
  - 2. Date of inspection and date of report.
  - 3. Project name, location, solicitation number, and Contractor.
  - 4. Names and titles of individuals making inspection, if not Contractor's Project Field Superintendent.
  - 5. Description of Contract requirements for inspection by referencing Specification Section.
  - 6. Description of inspection made, interpretation of inspection results, and notification of significant conditions at time of inspection.
  - 7. Requirements for follow-up inspections.

1.11 NON-COMPLIANCE CHECK-OFF LIST

- A. Maintain check-off list of Work that does not comply with Contract Documents, stating specifically what non-complying, date faulty Work was originally discovered, and date Work was corrected. No requirement to report deficiencies corrected same day it was discovered. Submit copy of Non-Compliance Check-Off List of non-complying work items to Architect on a weekly basis.

1.12 COMPLETION AND INSPECTION OF WORK

- A. Prior to final acceptance by Architect, submit a certification signed by Contractor to Architect stating that all Work has been inspected and all Work, except as specifically noted, is complete and in compliance with Contract Documents.
- B. Record Documents:
  - 1. By Contractor Quality Control Representative. Ensure that "As-Builts" required are marked to show any deviations which have been made during the course of construction and are kept current on a daily basis. Upon completion of the Work, certify the accuracy of the "As-Builts" and submit to Architect.
  - 2. Refer to Section 01 32 00 - Construction Progress Documentation.
  - 3. Refer to Section 01 78 00 - Closeout Submittals.

END OF SECTION 01 45 00

SECTION 01 51 00 - TEMPORARY UTILITIES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Section Includes:

1. Responsibility of Owner and Contractor.
2. Provisions for temporary electrical power.
3. Provisions for temporary lighting.
4. Provisions for temporary heating and ventilation
5. Provisions for temporary water.
6. Provisions for temporary telephone, fax and internet.
7. Regulatory Agency Requirements.

1.02 RESPONSIBILITY

A. Responsibility of Owner:

1. Owner is not responsible for the establishment or payment of any temporary utilities.
2. Pay all utility bills from the utility companies for Owner's existing established utility services within existing buildings and construction limits for the duration of construction.
3. Owner is not responsible for any costs directly to the contractor for non-established utility items including such items as fuels, tanks, generators, extensions, hookups, feeds, cords, hoses, wiring, etc. as may be required by the contractor for their ability to provide needed temporary utilities specified herein.
4. Owner is not responsible for any Contractor job overhead costs such as cell phones, fax, internet, water hauling, etc. that may be required as part of the construction activities.

B. Responsibility of Contractor:

1. Coordinate establishment, timing and all requirements of all temporary utilities
2. Provide temporary electrical power, as required.
6. Provide temporary lighting, as required.
7. Provide temporary heating and ventilation, as required.
8. Provide temporary water, as required.
9. Provide temporary telephone and internet, as required.
10. Coordinate shut-offs of any and all utilities with Owner at least 24 hours in advance.

1.03 DESCRIPTION

A. Temporary Electrical Power:

1. Contractor may use existing electrical service in the building.
2. Contractor and users provide grounded UL approved extension cords from existing power outlets.
3. Contractor to provide power for temporary lighting, heating, ventilation and air conditioning.
4. Contractor to provide power for pumping, welding and other special equipment or procedures.

B. Temporary Lighting:

1. Existing building lighting may be utilized.
2. Provide supplemental lighting for construction as required.

C. Temporary Heating and Ventilation:

1. Provide as required to protect work and products against dampness and cold.
2. Provide adequate ventilation for safe working environment in accord with health regulations.
3. Ventilation required to prevent hazardous accumulation and harmful exposure of dusts, fumes, mists, vapors or gases.

3. Building system may be used for temporary heat or A/C only with approval of Architect. Areas must be sufficiently cleaned so as not to cause damage to system from construction dust and dirt.
4. New filters are to be installed prior to operation of system.
5. Contractor to replace all filters with new in all temporary and permanently installed units during construction every two (2) weeks minimum, and more frequently during times and in areas of heavy demolition work. Maintain and install additional cloth filters over all return air outlets at all times.
6. New filters must be replaced just prior to owner occupancy.

D. Temporary Water:

1. Individual contractors and users provide hoses from existing hose bibbs.

E. Temporary Telephone and Internet:

1. Provide, maintain and pay for telephone service to Contractor's field offices throughout construction.
2. Contractor's job site superintendent is required to have a cellular/mobile phone at all times during normal working hours.
3. Use of cellular/mobile phones are allowed for temporary phone service.
4. Use of Owner's lines is prohibited; phone, fax, or internet.
5. If contractor desires internet or e-mail service for their use at the jobsite, the contractor shall be responsible to provide it, and shall bear all costs for its installation and use. Use of any Owner's wireless internet service is prohibited, without express permission.

1.04 REGULATORY AGENCY REQUIREMENTS

- A. Obtain and pay for permits as required by authorities.
- B. Obtain and pay for temporary easements as required across property other than Owners.
- C. Comply with applicable Federal, State, and Local Codes:
  1. Occupational Safety and Health Act of 1970, as amended.
  2. National Electric Code.
  3. National Electric Safety Code.
- D. Comply with Utility Regulations.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Materials may be new or used, adequate in capacity for the purpose intended, without creating unsafe conditions or violating codes.
- B. Comply with Electrical Basic Materials and Methods, Division 26:
  1. Temporary wiring shall include green equipment grounding conductor and all outlets shall be grounding type.
  2. Provide required facilities, including transformers, conductors, poles, conduits, raceways, breakers, fuses and switches.
  3. Provide vapor proof and explosion proof fixtures in applicable areas.
- C. Comply with Basic Mechanical Requirements, Division 23:
  1. Provide required facilities, including piping, valves, pumps, pressure regulators and tanks.
  2. Portable Heaters: Oil or gas fired with electric blower, not requiring vent from heated space.
  3. Salamanders shall not be used.



PART 3 - EXECUTION

3.01 GENERAL

- A. Comply with applicable sections of Division 23, Mechanical and Division 26, Electrical.
- B. Install work in neat and orderly manner, structurally sound.
- C. Locate services to avoid interference with traffic, work and storage areas, material handling equipment and cranes.
- D. Modify service as work progress requires.

3.02 INSTALLATION

- A. Electrical:
  - 1. Power extensions are not to interfere with school operations
- B. Heating and Ventilation:
  - 1. Locate to provide equitable distribution as required.

3.03 REMOVAL

- A. Remove completely all temporary materials and equipment upon completion of construction or when no longer required.
- B. Clean and repair damage caused by temporary installation and restore to satisfactory condition per Owner and Architect.
- C. Immediately prior to completion of project, remove temporary lamps and install new lamps throughout.

END OF SECTION 01 51 00

SECTION 01 53 00 - TEMPORARY CONSTRUCTION

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Section Includes:
  - 1. Temporary Structures:
    - a. Contractor's Field Offices.
    - b. Storage Trailers.
    - c. Enclosures.
    - d. Toilets.
    - e. Stairs, Ladders, Ramps, etc.
  - 2. Installation.
  - 3. Removal and Cleanup.
  - 4. Protection.
  - 5. Temporary Use of Elevator.

PART 2 - PRODUCTS

2.01 TEMPORARY STRUCTURES

- A. Contractor's Field Offices:
  - 1. Provided by Contractor if desired, not required.
- B. Storage Trailers or Containers:
  - 1. Provided by Contractor for storage of Owner furnished HVAC equipment
  - 2. Coordinate location with Owner.
  - 3. Remove at project completion and clean up area.
- D. Enclosures:
  - 1. Provided by each individual Contractor.
  - 2. Provide temporary weather-tight enclosures for all exterior openings.
- E. Toilets:
  - 1. Toilets in existing building will be designated by Owner for contractor use.
- F. Stairs, Ladders, Ramps, etc.:
  - 1. Provided by each individual contractor.
  - 2. Provide temporary stairs, ladders, ramps runways, scaffolds, derricks, chutes and similar items required for proper execution of work by the trades.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Temporary Structures:
  - 1. Locate as directed to avoid interference with work.
  - 2. Construct with code-approved service connections.
- B. Temporary Enclosures:
  - 2. Cover roof or wall openings to protect interior from weather.
- C. Temporary Construction Apparatus:
  - 1. Erect Scaffolding, securely in conformance with labor laws and safety codes.
  - 2. Construct stairs, ladders, ramps, runways and derricks security to sustain 100 psf minimum live load or as required for their use.

3.02 REMOVAL AND CLEAN UP

- A. Remove all temporary structures and materials completely upon completion of construction.
- B. Remove debris and clean area.
- C. Repair all damage and restore to finish condition.

3.03 PROTECTION

- A. Safety:
  - 1. Maintain lights and barricades on all obstruction and hazards during contract period in conformance to federal and local laws and codes.
- B. Fire Protection:
  - 1. Provide multi-purpose dry chemical extinguishers.
  - 2. Locate one extinguisher adjacent to each stairway.
  - 3. Wherever and whenever any burning, welding, cutting or soldering operations are in progress, or equipment is in use, or any work involving a fire hazard is performed, the Contractor or Subcontractor responsible for such operation shall have at all times acceptable fire extinguishers or protection within ten feet of the operation.
- C. Piping:
  - 1. Keep materials out of piping by capping or other protection.
  - 2. Trades responsible for stoppage shall bear expense of cleaning.
- D. Equipment:
  - 1. Each contractor and subcontractor shall take necessary precautions to protect and secure own equipment, tools and material.

3.04 TEMPORARY USE OF ELEVATOR

- A. Elevator may be used by Contractor for temporary service during construction, after installation and inspection.
- B. Provide and maintain temporary plywood lining and protective padding as required on floors, walls and ceiling of elevator cab.
- C. Clean and Restore:
  - 1. Inspect, clean, and restore to original condition, equal to new, all equipment and accessories.
  - 2. Replace all worn or damaged parts.
  - 3. Cost of temporary operation and repair shall be paid by Contractor.

END OF SECTION 01 53 00

SECTION 01 62 00 - PRODUCT OPTIONS AND SUBSTITUTIONS

PART 1- GENERAL

1.01 REQUIREMENTS INCLUDED

Section Includes:

1. Contractor's options.
2. Requests for substitutions.

1.02 CONTRACTOR'S OPTIONS

- A. For products specified only by referenced standards, select product meeting standards and submit for approval in accordance with this section.
- B. For products listing several manufacturers or model numbers, the following criteria apply:
  1. For specification sections naming a list of acceptable manufacturers and only one manufacturer's specific model name or number, alternate products from the list of acceptable manufacturers are acceptable only if they are equivalent to the named, specific, model name or number in all respects. If the alternate manufacturer's product is not equivalent to the named, specific, model name or number in all respects, then that manufacturer's product is not an acceptable substitution, even though they are named as an acceptable manufacturer in the specification section. Proposed products from listed alternate manufacturers with no model name or model number listed must be submitted in accordance with this section.
  2. For specification sections naming a list of acceptable manufacturers, and no specific model number from any of the listed manufacturers is named in the specification, alternate products from named manufacturers are acceptable provided that they are equivalent to the listed performance criteria and referenced standards in all respects. If the alternate manufacturer's product is not equivalent to the listed performance criteria and referenced standards in all respects, then that manufacturer's product is not an acceptable substitution, even though they are named as an acceptable manufacturer in the specification section.
  3. For specification sections naming a list of acceptable manufacturers and a number of manufacturer's specific model numbers, any of the named, specific, referenced products as listed are acceptable. Alternate products from the listed acceptable manufacturers are acceptable only if they are equivalent to at least one of the named, specific, model names or numbers in all respects. If the alternate manufacturer's product is not equivalent to at least one of the named, specific, model names or numbers in all respects, then that manufacturer's product is not an acceptable substitution, even though they are named as an acceptable manufacturer in the specification section. Proposed products from listed alternate manufacturers without a listed model name or number must be submitted in accordance with this section.
- C. For products specified by naming only one product and manufacturer, there is no option, and no substitution will be allowed. This item may have been specified in this manner to standardize the Owner's maintenance procedures or stock inventory, comply with the Owner's warranty requirements, or to maintain compatibility with existing construction. In some instances, this item may have been specified to determine a level of quality or performance desired and requests for substitutions may be accepted for consideration as determined by the Architect.

1.03 REQUESTS FOR SUBSTITUTIONS

- A. During period of bid preparation, Architect will consider written requests for substitutions, received at least ten (10) calendar days prior to bid date; requests received after that time will not be considered.
- B. Products proposed for installation by the Contractor and approved by the Architect shall not be changed except with written consent of the Architect.
- C. Submit all information to the Architect electronically via e-mail or CD, unless otherwise permitted. If hard copies are permitted, submit two (2) copies of all information.
- D. Include the following information in request.  
Submittals or product catalogs without the following specific information listed will not be considered.
1. Complete data substantiating compliance of proposed substitution with Contract Documents.
  2. Product Data:
    - a. Product identification, including manufacturer's name and address.
    - b. Manufacturer's literature;
      - 1) Product description.
      - 2) Performance and test data.
      - 3) Reference standards.
      - 4) Material safety and data sheets.
    - c. Samples.
    - d. Name and address of similar projects which may be visited in vicinity of project on which product was used and date of installation.
  3. Construction Method: detailed description and drawings of proposed method.
  4. Itemized comparison of proposed substitution with product or method specified.
  5. Data relating to changes in construction schedule.
  6. Relation to separate contracts.
  7. Accurate cost data on proposed substitution in comparison with product or method specified.
  8. Literature of item proposing to replace, proving equality and comparison.
- E. In making the request for substitution, Bidder/Contractor represents:
1. They have investigated proposed product or method and determined that it is equal or superior in all respects to that specified.
  2. They will provide the same warranty requirements for substitution item as for product or method specified.
  3. They will coordinate and accommodate installation of accepted substitution into the work, making such changes as may be required for work to be complete in all respects and trades.
  4. The Bidder/Contractor waives all claims for any and all additional costs or time related to this substitution which consequently become apparent, by contractor, subcontractors, vendors, and suppliers. Bidder/Contractor shall be responsible for any and all costs, direct or indirect, resulting from this Request.
  5. Cost data is complete and includes all related costs under his Contract, but excludes:
    - a. Costs under separate contracts.
    - b. Architect's redesign costs, if any.
- F. Substitutions will not be considered if (in the opinion of the Architect):
1. Request is not received within the proper timeframe for consideration prior to the bid date.
  2. Request does not contain the proper information for determination of substitution.
  3. Item has been specified with no substitutions permitted.
  4. Item is not considered to be equal to that specified.
  5. Item would require substantial revision to the Contract Documents or design intent.
  6. Item would have an adverse effect on the project or construction schedule.

7. Item would have an adverse effect on other trades or scope of work.
  8. Item is deemed unacceptable by the Owner for any reason.
  9. Item is deemed not equal to the desired aesthetic or have an adverse aesthetic effect; including colors, textures, patterns or appearance specified or intended.
  10. They are indicated or implied on shop drawings or project data submittal without formal request submitted in accordance with this Section.
  11. They have not been included in an addendum during bidding.
  12. They are made after award of Contract.
- G. It is the responsibility of the bidder to make a complete and proper submission for their request for substitution, to the correct party as indicated in the specifications and within the required timeframe. The Architect is not responsible for any errors in the bidders submission, including such items as sending information to the incorrect contact person, or sending the request to the incorrect mailing address, fax number or e-mail address.
- H. The decision of the Architect is FINAL.

END OF SECTION 01 62 00

SECTION 01 64 00 - OWNER-FURNISHED EQUIPMENT

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Section Includes:
1. Description of work.
  2. Definitions.
  3. Protection and Cleaning.
  4. Building Systems.

1.02 DESCRIPTION OF WORK

- A. Coordinate the installation of the equipment or system with all trades. Any problem noted shall be brought to the attention of the Architect. This notification must be submitted in writing and no claims for additional work shall be considered unless the request for clarification has been initiated by the Contractor.
- B. Work includes installation of owner furnished items as noted on drawings and coordination of owner installed items with owner's representatives, and vendors and suppliers.

1.03 DEFINITIONS

- A. OFCI: (Owner Furnished - Contractor Installed)
1. The Owner shall be responsible for furnishing equipment or system for installation by Contractor.
  2. The Contractor shall be responsible for receiving, storing, protecting, providing all rough-in services, installing and testing of the equipment or system. The Contractor shall receive, inventory, verify quantity and condition and notify the Owner of any discrepancies or damage. The Contractor shall provide coordination, blocking, connections and all provisions necessary to fully incorporate into the project, scope, building and site.
- B. CFCI: (Contractor Furnished - Contractor Installed)
1. The Contractor shall be responsible for ordering, receiving, storing, protecting, installing and testing of the equipment or system.
  2. Unless otherwise noted, ALL work shown on drawings and specified is C.F.C.I.
- C. OFOI: (Owner Furnished - Owner Installed)
1. The Owner shall be responsible for furnishing and installing this equipment or system.
  2. The Contractor shall be required to furnish any rough-ins as shown on the Contract Documents, and cooperate with the Owner and their vendors to coordinate this work with work of the Contract.

1.04 PROTECTION & CLEANING

1. Contractor shall protect and clean all O.F.C.I. items, treating them the same as if they had been purchased by the contractor.

1.05 BUILDING SYSTEMS

- A. HVAC Equipment:
1. Owner's Responsibility:
    - a. Placed order for LG equipment through procurement process.
    - b. Equipment delivery to job site
    - c. Provide shop drawings and installation diagrams
  2. Contractor's Responsibility:
    - a. Furnish and install all other materials required for a complete, fully operational system
    - b. Provide equipment and labor to receive and unload equipment upon delivery.

- c. Provide weatherproof storage trailers or containers for storage of Owner furnished HVAC equipment upon delivery until installation.
- d. Install all Owner provided equipment complete with all supplemental materials required for a complete installation.
- e. See Mechanical Drawings and Specifications for additional information and clarification.

END OF SECTION 01 64 00



SECTION 01 65 00 - PRODUCT DELIVERY AND HANDLING

PART 1- GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Section Includes:
1. Material shipments and project delivery to job site.
  2. Handling of materials and products included in project.
  3. Phasing of the work.

1.02 DELIVERY

- A. Delivery materials, supplies or equipment to Project site during working hours.
- B. Deliveries made during other than normal working hours must be received by an authorized agent of the Contractor.
- C. No employee of the Owner is authorized to receive any shipment designated for this project.
- D. The Owner assumes no responsibility for receiving any shipments designated for this project.
- E. Under no circumstances may shipments be directed to, or in care of, the Owner.

1.03 HANDLING

- A. All materials furnished under this Contract shall be identified, shipped, addressed, consigned, etc., to the Contractor who may be charged therewith by giving the name of the Contractor, the name of the project, the street and the city.

1.04 PHASING OF THE WORK

- A. Work may be phased, limiting installation of materials to separate areas of site or times of construction.
- B. Any and all coordination of materials on site related to phasing of the work shall be accomplished by the Contractor at no additional costs to the Owner.
- C. All materials, equipment, and associated items and components for the scope of work are to be delivered to the site only as and when needed for installation. Time allowed on site prior to installation shall be a reasonable timeframe as deemed acceptable by the Architect.
- D. All items on site shall be stored off the ground and protected by watertight encapsulating cover in preparation for immediate installation.
- E. Any and all items on site in a timeframe deemed unacceptable by the Architect for any reason, or deemed to be damaged by improper handling or storage, are to be removed from the site and returned to the manufacturer, without cost to the Owner. Products shall be replaced entirely with new materials at the time needed and deemed acceptable for installation.

END OF SECTION 01 65 00

SECTION 01 73 29 - CUTTING AND PATCHING

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Section Includes:

1. Make several parts fit properly.
2. Uncover work to provide for installation of ill-timed work.
3. Remove and replace defective work.
4. Remove and replace work not conforming with requirements of Contract Documents.
5. Remove samples of installed work as specified for testing.
6. Remove existing construction necessary to install new materials, equipment, mechanical or electrical items.

PART 2 - PRODUCTS

2.01 MATERIALS

For replacement of work removed: Comply with Specifications.

PART 3 - EXECUTION

3.01 PREPARATION

A. General:

1. Do not endanger any other work by cutting or altering work or any part of it.
2. Do not cut or alter work of another contractor without the written consent of Architect.
3. Patching and refinishing shall be executed by the trade experienced in such finishing work.

B. Prior to cutting:

1. Provide shoring, bracing and support as required to maintain structural integrity of project.
2. Provide protection for other portions of project.
3. Provide protection from elements.
4. Advise Architect designating time work will be uncovered to provide for observation.

3.02 PERFORMANCE

- A. Execute cutting and demolition by methods which will prevent damage to other work and will provide proper surfaces to receive installation of repairs and new work.
- B. Execute excavating and backfilling by methods which will prevent damage to other work and will prevent settlement.
- C. Execute fitting and adjustment of products to provide a finished installation to comply with specified tolerances, finishes.
- D. Cut existing concrete openings for piping, floor drains, etc., by core drilling.
- E. Cut existing walls, floors, ceilings, roofs, etc. necessary for the proper installation of new materials, equipment, mechanical or electrical items. Provide all necessary framing, lintels, hangers, etc. to maintain the structural integrity of the building system after cutting.
- F. Restore work which has been cut or removed; install new products to provide completed work in accord with requirements of Contract Documents.

- G. Contractor is responsible for cost to restore or patch adjacent surfaces to original condition.
- H. Fit work airtight to pipes, sleeves, ducts, conduits and other penetrations.
- I. Refinish entire surface as necessary to provide an even finish.
  - 1. Continuous surfaces: To nearest intersections.
  - 2. Assembly: Entire refinishing.

END OF SECTION 01 73 29

SECTION 01 74 23 - CLEANING

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Section Includes:
1. Description of general cleaning requirements.
  2. Regulatory agency requirements.
  3. Cleaning during construction.
  4. Final Cleaning.

1.02 DESCRIPTION

- A. The General Contractor is responsible for all cleaning unless specifically noted otherwise.
- B. Maintain premises and public properties free from accumulations of waste, debris, and rubbish, caused by operations.
- C. Remove temporary piping and wiring: by respective contractors.
- D. At completion of work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all sight-exposed surface; leave project clean and ready for occupancy.

1.03 REGULATORY AGENCY REQUIREMENTS

- A. Maintain project in accord with Occupational Safety & Health Act of 1970 as amended, in terms of clean up.
- B. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
1. Do not burn or bury rubbish and waste materials on project site.
  2. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains, or bury below ground.

PART 2 - PRODUCTS

2.01 MATERIAL

- A. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
- B. Use cleaning materials only on surfaces recommended by cleaning material manufacture.

PART 3 - EXECUTION

3.01 CLEANING DURING CONSTRUCTION

- A. Execute cleaning to insure that building, grounds and public properties are maintained free from accumulations of waste material and rubbish on a daily basis by all trades.
- B. At reasonable intervals during progress of Work, clean site and public properties, and dispose of waste materials, debris and rubbish.
- C. Provide on-site containers for collection of waste materials, debris and rubbish.
- D. Remove waste materials, debris and rubbish from site and legally dispose of at public or private dumping areas off Owner's property.

- E. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.
- F. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces.
- G. Ensure that no construction materials or items are accessible to public on site or grounds.

3.02 FINAL CLEANING

- A. Employ experienced workman or professional cleaners for final cleaning.
- B. In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.
- C. Remove grease, dust, dirt, stains, labels, fingerprints and other foreign materials from sight-exposed interior and exterior finished surfaces; polish surfaces so designated to shine finish.
- D. Clean and polish fixtures, equipment and materials.
- E. Repair, patch and touch-up marred surfaces to specified finish, to match adjacent surfaces.
- F. Vacuum all carpeted areas
- G. Remove all foreign materials from roof and site area.
- H. Broom clean paved surfaces; rake clean other surfaces of grounds.
- I. Mechanical and Work:
  - 1. Respective contractors shall perform cleaning of their equipment.
  - 2. Mechanical contractor shall clean all strainers in his respective piping work.
  - 3. Replace throw-away type air conditioning filters or media if units were operated during construction, or clean ducts, blowers and coils if air conditioning units were operated without filters.
  - 4. This does not include replacing filters used for performance testing and balancing.
- J. Conduct final cleaning and preparation of surfaces and materials as per manufacturer's recommendation and in strict accordance with manufacturer's guidelines.
- K. Owner will assume responsibility for cleaning as time designated on Certificate of Substantial Completion, Conditional Acceptance or partial occupancy, whichever is first, for Owner's acceptance of Project or portion thereof.

END OF SECTION 01 74 23

SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1- GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Section Includes:
1. Administrative procedures in closing out the work.
  2. Procedures for Substantial Completion.
  3. Procedures for Final Inspection.
  4. Required contractor guarantees.
  5. Evidence of payments and release of liens.
  6. Final adjustment of accounts.
  7. Final Application and Certificate for Payment.
  8. Post construction inspection.
  9. Closeout submittals required are specified in Section 01 78 00.
  10. Closeout maintenance materials required are specified in Section 01 78 46.

1.02 SUBSTANTIAL COMPLETION

- A. Submit written certification to Architect that project or designated portion of project is substantially complete and ready for use by Owner.
- B. Architect will make an inspection within a reasonable time after receipt of such notice. The Contractor is responsible for the final punchlist inspection in accordance with the General Conditions. No inspection by the Architect will be made until the Contractor submits written certification that the punchlist has been issued and complete. The Architect's Substantial Completion inspection is not for the purpose of preparing a "to-do" list for the Contractor to use in finishing the work. If it becomes apparent at the time of the Substantial Completion inspection that items affecting life safety, accessibility, security, or full intended use of space are not complete, the inspection will be terminated and the Contractor will be liable for the costs of re-inspection.
- C. Should Architect consider that work is not substantially complete:
1. Architect shall immediately notify Contractor, in writing, stating reasons.
  2. Contractor to remedy deficiencies and send second written notice of substantial completion to Architect.
  3. Architect will re-inspect Work.
  4. Contractor to pay costs of Architect's re-inspection.
- D. When Architect/Engineer considers that work is substantially complete; Architect will prepare and issue a Certificate of Substantial Completion, AIA Document G704, complete with signatures of Owner and Contractor, accompanied by Contractor's list of items to be completed or corrected ("Punchlist") as verified and amended by the Architect. Retainage amounts will be adjusted per General Conditions and Supplementary General Conditions.

1.03 FINAL INSPECTION

- A. Contractor shall submit written certification that:
1. Contract Documents have been reviewed.
  2. Work has been completed and inspected in accordance with Contract Documents.
  3. Equipment and systems have been tested in presence of Owner's representative and are operational.
  4. Work is completed, and ready for final inspection.
  5. If any items from the Certificate of Substantial Completion Inspection are not completed, the final inspection will be terminated and the Contractor will be liable for the costs of re-inspection.

- B. Architect will make final inspection after receipt of certification.
- C. Should Architect consider that work is incomplete or defective:
  - 1. He shall promptly notify Contractor, in writing, stating reasons.
  - 2. Contractor shall take immediate steps to remedy the stated deficiencies, and send second written notice to Architect/Engineer certifying that Work is complete.
  - 3. Architect will re-inspect Work.
  - 4. Contractor to pay costs of Architect's re-inspection.
  - 5. Final payment will not be released.
- D. When Architect finds that work is acceptable in accordance with Contract Documents, he shall request contractor to prepare Project Closeout Submittals in accordance with Section 01 78 00.

1.04 GUARANTEES

- A. Contractor agrees to make good all damage to the construction of building or site or equipment which in the opinion of the Architect is a result of or incidental to the use of materials, equipment or workmanship which are inferior, defective or not in accordance with the specifications.
- B. In case repairs become necessary, the Owner will give written notice to the Contractor to make same and in case of failure of the Contractor to commence such repairs within 30 days after such notice, the Owner may make the repairs either by its own employees or by independent contract and may thereupon recover from the Contractor and his Sureties the cost of the repairs so made together with the cost of supervision and inspection thereof. The Owner will have sixty (60) days after the expiration of said guarantee period in which to notify the Contractor of any such repairs necessary on the date of such expiration. The determination of the necessity for repairs shall rest entirely with the Architect whose decision upon the matter shall be final and obligatory upon the Contractor.
- C. The Guarantees herein stipulated shall extend to the whole body of the improvement and all its appurtenances.

1.05 EVIDENCE OF PAYMENTS AND RELEASE OF LIENS

- A. Contractor to execute and submit:
  - 1. Contractor's Affidavit of Payment of Debts and Claims (AIA Document G706).
  - 2. Contractor's Affidavit of Release of Liens (AIA Document G706A)
  - 3. Consent of Surety to Final Payment (AIA Document G707).
- B. All submittals shall be duly executed before delivery to Architect.

1.06 FINAL ADJUSTMENT OF ACCOUNTS

- A. Submit final statement of account to Architect.
- B. Statement shall reflect all adjustments:
  - 1. Original Contract Sum.
  - 2. Additions and deductions resulting from:
    - a. Change Orders.
    - b. Contingency Allowance.
    - c. Deductions for uncorrected work.
  - 3. Total Contract Sum, as adjusted.
  - 4. Previous payments.
  - 5. Sum remaining due.

- C. Architect will prepare final Change Order reflecting approved adjustments to Contract Sum not previously made by Change Orders or Allowance Adjustments.

1.07 FINAL APPLICATION AND CERTIFICATE FOR PAYMENT:

- A. Contractor shall submit final application in accordance with procedures and requirements of General and Supplementary Conditions prior to submission of Final Application and Certificate for Payment.
- B. Architect will review Final Application and issue Final Certificate in accordance with provisions of General Conditions.
- C. Should final completion be materially delayed through no fault of Contractor, Architect may issue a Semi-Final Certificate for Payment in accordance with provisions of General Conditions.

1.08 POST CONSTRUCTION INSPECTION

- A. Prior to expiration of one year from date of Substantial Completion, Architect may make visual inspection of Project in company with Owner and Contractor to determine whether correction of Work is required in accordance with provisions of General Conditions.
- B. For Guarantee beyond one year Architect may make inspections at request of Owner after notification to Contractor.
- C. Architect will promptly notify Contractor, in writing, of any observed deficiencies.
- D. Any/all corrections to work at that time to be at Contractor's expense.

END OF SECTION 01 77 00



SECTION 01 78 00 - CLOSEOUT SUBMITTALS

PART 1- GENERAL

1.01 REQUIREMENTS INCLUDED

A. Section Includes:

1. Operation and Maintenance Manuals.
2. Product Warranties.
3. Project Record Documents (As-Built Drawings).
4. Spare-Parts.
5. Certificates of Inspection.
6. Instruction of Owner's Personnel.
7. Certificate of Occupancy.
8. Certification of Asbestos and Lead-Based Paint.
9. Closeout maintenance materials required.

B. Unless specifically permitted by the Architect, the Contractor is to provide all items listed herein to the Owner via the Architect prior to the date of Substantial Completion.

1.02 OPERATION AND MAINTENANCE MANUALS

A. Submission Requirements:

1. Furnish Owner with all manual information electronically on USB drive in PDF format.
2. Furnish Owner with two (2) sets of bound hard copy manuals.
3. Submit to Architect for review of information and forwarding to Owner for Owner's records.

B. Preparation:

1. Prepare data by personnel experienced in maintenance and operation of described products.
2. Obtain information directly from manufacturer of equipment or product.

C. Format:

1. Prepare organization of data in the format of an instructional manual.
2. Cover:
  - a. Identify manual with title OPERATION AND MAINTENANCE MANUAL.
  - b. Identify title of Project.
  - c. Identify subject matter of contents.
3. Organization:
  - a. Divide sections for each separate product and system, with description of product and major component parts of equipment.
  - b. For any hard copies required, provide tabbed dividers between each section.
4. Text:
  - a. Include all manufacturer's published data and product cutsheets.
  - b. For any hard copies required, provide on 20 pound paper.
5. Drawings:
  - a. Provide applicable drawing files from manufacturer or Architect's drawing files as required. Contact Architect to obtain PDF drawing files as needed.
  - b. For any hard copies required, provide with reinforced punched binder tab. Bind in with text. Fold larger drawings to size of text pages.
6. Binders (for any hard copies required):
  - a. Commercial quality, 8-1/2 x 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size.

- b. When multiple binders are used, correlate data into related consistent groupings.

D. Contents:

1. Table of Contents:  
Provide title of Project; names, addresses, and telephone numbers of Architect/Engineer, Subconsultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.
2. For Each Product or System:  
List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
3. Product Data:  
Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
4. Drawings:  
Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
5. Typed Text:  
As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.
6. Warranties:  
Include a copy of each.
7. Reports:  
Include a copy of all test reports, certificates, testing and balance data, etc.

E. Manual for Materials and Finishes:

1. Building Products, Applied Materials, and Finishes:  
Include product data, with catalog number, size, composition, and color and texture designations. Provide information for re-ordering custom manufactured Products.
2. Instructions for Care and Maintenance:  
Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
3. Moisture Protection and Weather Exposed Products:  
Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
4. Additional Requirements:  
As specified in individual Product specification Sections.
5. Provide a list of all materials and finishes with scanned photo files or actual samples of all products.

F. Manual for Equipment and Systems:

1. Each Item of Equipment and Each System:  
Include description of unit or system, and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.
2. Panelboard Circuit Directories:  
Provide electrical service characteristics, controls, and communications; typed.
3. Operating Procedures:  
Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
4. Maintenance Requirements:  
Include routine procedures and guide for preventative maintenance and trouble shooting;

disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

5. Include color coded wiring diagrams as installed.
6. Provide servicing and lubrication schedule, and list of lubricants required.
7. Include manufacturer's published operation and maintenance instructions.
8. Include sequence of operation by controls manufacturer.
9. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
10. Provide control diagrams by controls manufacturer as installed.
11. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.
12. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
13. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
14. Include test and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing.
15. Additional Requirements as specified in individual Product specification Sections.
16. Provide a list of design data, settings, setpoints, etc., as applicable for equipment.

1.03 PRODUCT WARRANTIES

A. Submission Requirements:

1. Furnish Owner with all warranty information electronically on CD in PDF format.
2. Furnish Owner with two (2) sets of bound hard copy warranties.
3. Submit to Architect for review of information and forwarding to Owner for Owner's records.

B. Preparation:

1. Gather Warranties required for specific Products or Work as specified in each individual Section.
2. Obtain information directly from responsible Subcontractor, supplier, and manufacturer of equipment or product within 10 days after completion of applicable item of Work.
3. Except for items put into use with Architect approval, leave date of beginning of time of warranty until the Date of Final Acceptance is determined.
4. Verify that documents are in proper form, are complete, contain full information, are notarized, and are fully executed and valid.
5. Co-execute submittals when required.
6. Retain warranties until time specified for submittal.

C. Format:

1. Prepare organization of data in the format of an instructional manual.
2. Cover:
  - a. Identify manual with title WARRANTIES.
  - b. Identify title of Project.
  - c. Identify subject matter of contents.
3. Organization:
  - a. Separate each warranty keyed to the Table of Contents listing.  
Provide full information, using separate typed sheets as necessary.
  - b. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
  - c. For any hard copies required, provide tabbed dividers between each warranty.
4. Binders (for any hard copies required):
  - a. Commercial quality, 8-1/2 x 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size.

b. When multiple binders are used, correlate data into related consistent groupings.

D. Contents, Each Volume:

1. Table of Contents:

Neatly typed, in sequence of Table of Contents of Project Manual, with each item identified with number and title of specification Section in which specified, and name of Product or Work item.

E. Time of Submittals:

1. For equipment or component parts of equipment put into service during construction with Architects approval, submit documents within 10 days after acceptance.
2. Make other submittals within 10 days after Date of Final Completion, prior to final Application for Payment.
3. For items of Work for which acceptance is delayed beyond Date of Final Completion, submit within 10 days after acceptance.

1.04 PROJECT RECORD DRAWINGS ("AS-BUILTS")

A. Submission Requirements:

1. Furnish Owner with original record document prints.
2. Furnish Owner with one (1) additional hard copy set of record document prints.
3. Furnish Owner with all as-built information electronically on CD in PDF format.
4. Submit to Architect for review of information and forwarding to Owner for Owner's records.

B. Project Record Documents required:

1. Marked-up copies of Contract Drawings.
2. Marked-up copies of Shop Drawings.
3. Marked-up copies of Specifications, addenda and Contract Modifications.
4. Marked-up Product Data submittals.
5. Field records for variable and concealed conditions.
6. Record information on Work that is recorded only schematically.

C. Maintenance of Documents:

Store record documents in field office apart from Contract Documents used for construction. Do not permit Project Record Documents to be used for construction purposes. Maintain and protect record documents from damage in a clean, dry, legible condition. Make documents available at all times for inspection by Architect.

D. Record Drawings:

1. During construction, maintain a set of black-line white-prints of Contract Drawings and Shop Drawings for Project Record Document purposes.
  - a. Mark these Drawings to indicate actual installation where installation varies from installation shown originally. Give particular attention to information on concealed elements which would be difficult to identify or measure and record later. Items required to be marked include but are not limited to:
    - 1) Dimensional changes to Drawings.
    - 2) Revisions to details shown on Drawings.
    - 3) Depths of foundations below first floor.
    - 4) Locations and depths of underground utilities.
    - 5) Revisions to routing of piping and conduits.
    - 6) Revisions to electrical circuitry.
    - 7) Actual equipment locations.
    - 8) Duct size and routing.

- 9) Locations of concealed internal utilities.
  - 10) Changes made by Contract Modification.
  - 11) Details not on original Contract Drawings.
  - b. Responsibility for Markup and Supervision:  
Contractor Quality Control Representative; as specified in Section 01 45 00 - Quality Control. Where feasible, individual or entity who obtained record data, whether individual or entity is installer, subcontractor, or similar entity, is required to prepare mark-up on Record Drawings.
    - 1) Accurately record information in an understandable Drawing technique.
    - 2) Record data as soon as possible after it has been obtained. In case of concealed installations, record and check mark-up prior to concealment.
    - 3) Contractor Quality Control Representative: Affix signature and certify accuracy of Record Drawings.
  - c. Mark completely and accurately record prints of Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions. Where Shop Drawings are marked, show cross-reference on Contract Drawings location.
  - d. Mark record sets with red erasable colored pencil; use other colors to distinguish between changes for different categories of Work at same location.
  - e. Mark important additional information which was either shown schematically or omitted from original Drawings.
  - f. Note construction change directive numbers, alternate numbers, Contract Modification numbers and similar identification.
  - g. At time of Final Acceptance, submit record Drawings to Architect for Owner records. Organize into sets, bind and label sets for Owner's continued use.
2. Preparation of Transparencies:
- a. Immediately prior to inspection for Final Acceptance, review completed marked-up record Drawings with Architect. When authorized, prepare a full set of corrected transparencies of Contract Drawings and Shop Drawings.
  - b. Incorporate changes and additional information previously marked on print sets. Erase, redraw, and add details and notations where applicable. Identify and date each Drawing; include printed designation "PROJECT RECORD DRAWINGS" in a prominent location on each Drawing.
  - c. Refer instances of uncertainty to Architect for resolution.
  - d. One set of transparencies of original Contract Drawings will be furnished to Contractor by the Owner for use in recording changes and additional information. Other printing as required is Contractor's responsibility.
  - e. Review of Transparencies:  
Before copying and distributing, submit corrected transparencies and original marked-up prints to Architect for review. When acceptable, Architect will initial and date each transparency, indicating acceptance of general scope of changes and additional information recorded, and of quality of drafting.
  - f. Transparencies and original marked-up prints will be returned to Contractor for organizing into sets, printing, binding and final submittal.
3. Copies and Distribution:
- After completing preparation of transparency Record Drawings, print (three ) 3 black-line prints of each Drawing, whether or not changes and additional information were recorded. Organize copies into manageable sets. Bind each set with durable paper cover sheets, with appropriate identification, including titles, dates and other information on cover sheets.
- a. Organize and bind original marked-up set of prints that were maintained during construction in

same manner.

- b. Organize record transparencies into sets matching print sets. Place each set in durable tube-type Drawing containers with end caps. Mark end cap of each container with suitable identification.

E. Additional Record Submittals:

1. Refer to other specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Immediately prior to Final Acceptance, complete additional records and place in order, properly identified and bound or filed, ready for use and reference. Submit to Architect.
  - a. Categories of requirements resulting in miscellaneous records include, but are not limited to the following:
    - 1) Field records on excavations and foundations.
    - 2) Field records on underground construction and similar Work.
    - 3) Survey showing locations and elevations of underground lines.
    - 4) Inverted elevations of drainage piping.
    - 5) Survey establishing building lines and levels.
    - 6) Authorized measurements utilizing unit prices or allowances.
    - 7) Records of plant treatment.
    - 8) Ambient and substrate condition tests.
    - 9) Certifications received in lieu of labels on bulk products.
    - 10) Batch mixing and bulk delivery records.
    - 11) Testing and qualification of tradesmen.
    - 12) Documented qualification of installation firms.
    - 13) Load and performance testing.
    - 14) Inspections and certifications by governing authorities.
    - 15) Leakage and water-penetration tests.
    - 16) Fire resistance and flame spread test results.
    - 17) Final inspection and correction procedures.

1.05 SPARE-PARTS

- A. Provide Products, replacement stock, spare parts, maintenance, and extra materials in quantities specified in individual specification Sections.
- B. Deliver to Project Site and place in location as directed by Architect; obtain receipt prior to Final Payment.

1.06 CERTIFICATES OF INSPECTION

- A. HVAC.
- B. Elevator.

1.07 INSTRUCTION OF OWNER'S PERSONNEL

- A. Prior to final inspection or acceptance, fully instruct Owner's designated operating and maintenance personnel in the operation, adjustment, and maintenance of all products, equipment and systems.
- B. Such instructions shall occur at a time designated by the Architect/Engineer at the completion of the job at a meeting set up by the contractor and attended by the representatives of the Owner and manufacturer.
- C. Services of factory instructor or representative to teach Owner's representative on operation of equipment will be arranged by the contractor, shall begin after equipment has been placed in

satisfactory operating condition and shall continue for a period of time as deemed necessary by the Architect.

- D. Contractor shall verify in writing that such periods of instruction have been held with the Owner's representative.
- E. Minimum length of training session to be two (2) hours.
- F. Session will need to be videotaped by Contractor for use by Owner.
- G. Notify Architect to attend all training sessions.

1.08 CERTIFICATION OF ASBESTOS MATERIAL AND LEAD-BASED PAINT

- A. The use of asbestos containing materials, in excess of 1 percent as defined by applicable US Environmental Protection Agency regulations, is prohibited in the project.
- B. The use of lead-based paint is prohibited in the project.
- C. Prepare and submit to the Architect the "Certification of Asbestos and Lead-Based Paint (Existing Building) " for existing buildings or portions of buildings (attached).
- D. Prepare and submit to Architect the "Certification of Asbestos and Lead-Based Paint (New Work) " for new material furnished or installed as part of the Work (attached).

END OF SECTION 01 78 00

**Certification of Asbestos and Lead-Based Paint**  
(Existing Building)

To: TowerPinkster  
Subject: Certification for a building built after 1990  
Facility name: \_\_\_\_\_  
Facility address: \_\_\_\_\_

**Certification for existing building:**

I / We certify under penalty of perjury under the laws of the United States that the following is true and correct. This building was constructed after 1990 and is free of asbestos containing material in excess of 1 percent as defined by applicable US Environmental Protection Agency regulations, and lead-based paint except as specifically listed below. This certification includes all areas of the building(s), including but not limited to; the roof and flooring.

Owner name: \_\_\_\_\_

Signature: \_\_\_\_\_

Address: \_\_\_\_\_  
\_\_\_\_\_

Telephone: \_\_\_\_\_ Date executed: \_\_\_\_\_

Materials containing asbestos/lead-based paint	Location/room within facility

The penalty for making a false statement is prescribed by 18 USC 1001.



**Certificate of Asbestos and Lead-Based Paint**  
(New Work)

To: TowerPinkster  
Subject: Certification for new construction  
Facility name:

---

Facility address:

---

**Certification for new construction:**

This Contractor hereby certifies that no asbestos-containing material in excess of 1 percent as defined by applicable US Environmental Protection Agency regulations, and lead-based paint has been furnished or installed at the referenced project.

Contractor name:

---

Signature:

---

Address:

---

Telephone: \_\_\_\_\_

Date executed: \_\_\_\_\_

The penalty for making a false statement is prescribed by 18 USC 1001.

SECTION 07 52 16.01 - SBS MODIFIED BITUMEN ROOFING

PART 1 - GENERAL

1.01 SUMMARY

- A. Existing roof system is a two-ply SBS membrane system with a finished surface of granules. The base ply is mechanically fastened over the roof insulation with torched laps. The granulated cap sheet is torched over the base-ply.
- B. Work includes any repairs or modifications to accommodate new HVAC equipment.
- C. Current system is no longer under warranty.

PART 2 - PRODUCTS

2.01 GENERAL APPROVED SYSTEMS

- A. Field Membrane
  - SOPREMA  
Base Ply: Sopralene Flam 180  
Cap Ply: Sopralene Flam 180 Granules
- B. Flashing
  - SOPREMA  
Base Ply: Sopralene Flam 180  
Cap Ply: Sopralene Flam 180 Granules
- C. The Soprema 32/48 Soprafix system will be used as a standard for this project for the field of the roof. Soprema 32/50 will be the standard for the flashing. Substitute materials or system must be equal to or better than the standard set in this specification.
- D. Alternate manufacturers dual reinforced systems are acceptable as follows:
  - 1. Woven Fiberglass with Non-Woven Fiberglass
  - 2. Non-Woven Polyester with Woven Fiberglass.

2.02 MEMBRANE

- A. Membrane Base Ply: SOPRALENE FLAM 180 or SOPRAFIX
  - 1. Description: Field base ply shall have non-woven polyester reinforcement and thermofusible elastomeric asphalt. Both sides shall have a thermofusible plastic film. This membrane is to be applied by mechanically fastening the sheets, and torch sealing the seams. Over concrete roof decks, Contractor may, at his/her option, torch apply the base ply. Alternate manufacturer=s systems using torch applied base sheet with torch sealed seams are acceptable.
  - 2. Components: Reinforcement shall be 3.68 lbs./sq. non-woven polyester. Elastomeric asphalt shall be a mix of selected bitumen and SBS thermoplastic polymer.
  - 3. Physical properties:
    - a. Tensile Strength  
Longitudinal - 119 lbs./in.  
Transversal - 88 lbs./in.
    - b. Ultimate elongation:  
Longitudinal - 58%.  
Transversal - 64%
    - c. Static puncture strength - 67 lbs.
    - d. Low temperature flexibility, no cracking at - 22°F.
    - e. SBS elongation - 1500%

B. Field Cap membrane Ply: SOPRALENE FLAM 180 FR GRANULES

Field Cap - Torch applied sheet with torch sealed seams.

1. Description: Field Cap Membrane Ply shall have special non-woven polyester reinforcement and thermofusible elastomeric asphalt. The topside shall be self-protected with colored granules. The underside shall have a thermofusible plastic film. This membrane is to be applied by torching only.
  - a. Color to be chosen by architect from standard stock colors.
2. Components: Reinforcement shall be 3.68 lbs./50 sq. non-woven polyester. Elastomeric asphalt shall be a mix of selected bitumen and SBS thermoplastic polymer.
3. Physical properties:
  - a. SBS average elongation 1500%
  - b. SBS average softening 265°F
  - c. SBS average low temperature flexibility: - 22°F
  - d. SBS average penetration (40{in 1/10 units at 5 sec.}).
  - e. SBS average homogeneity  $\geq$  level 6 (Soprema methods utilizing fluorescence microscopy at 250-x magnification).
4. Membrane Weight and Measurement:
  - a. Approximate Weight per Square Foot - 1.12 lbs.
  - b. Approximate Thickness - 160 mils.

2.03 FLASHING

A. Flashing Base Membrane Ply: Sopralene Flam 180

Method of Application - Flashing Base - Torch Flashing Cap - Torch

1. Description: Field base flashing membrane shall have non-woven polyester reinforcement and thermofusible elastomeric asphalt. Both sides shall have a thermofusible plastic film. This membrane is to be applied by **torching only**.
2. Components: Reinforcement shall be 3.68 lbs./sq. non-woven polyester. Elastomeric asphalt shall be a mix of selected bitumen and SBS thermoplastic polymer.
3. Physical Properties:
  - a. SBS average elongation: 1500%
  - b. SBS average softening: 265°F.
  - c. SBS average low temperature flexibility:-22°F
  - d. SBS average penetration (40 {in1/10 units at 5 sec.})
  - e. SBS average homogeneity  $\geq$  level 6 (Soprema method utilizing fluorescence microscopy at 250-x magnification).
4. Membrane Weight and Measurement:
  - a. Approximate Weight per Square Foot - 1.12 lbs.
  - b. Approximate Thickness - 160 mils.

B. Flashing cap Membrane Ply: SOPRALENE FLAM 180 GRANULES

1. Description: Field cap flashing membrane shall have special non-woven polyester reinforcement and thermofusible elastomeric asphalt. The topside shall be self-protected with colored granules. A thermofusible plastic film shall protect the underside. This membrane is to be applied by **torching only**.
  - a. Color to be chosen by architect from standard stock colors.
2. Components: Reinforcement shall be 3.68 lbs./sq. non-woven polyester. Elastomeric asphalt shall be a mix of selected bitumen and SBS thermoplastic polymer.
3. Physical Properties:
  - a. SBS average elongation: 1500%
  - b. SBS average softening: 265°F.
  - c. SBS average low temperature flexibility:-22°F
  - d. SBS average penetration (40 {in1/10 units at 5 sec.})

- e. SBS average homogeneity  $\geq$  level 6 (Soprema method utilizing fluorescence microscopy at 250-x magnification).
- 4. Membrane Weight and Measurement
  - a. Approximate Weight per Square Foot - 1.12 lbs.
  - b. Approximate Thickness - 160 mils.

#### 2.04 FASTENERS

- A. Wood: 1" round head roofing nails of galvanized steel, long enough to penetrate by at least 3/4 inch on flashing and parapet walls.
- B. Masonry: Nail-in expansion type devise with zinc body, plated steel nail, and long enough to embed into the masonry a minimum of 1 inch.
- C. Insulation: Mechanical fasteners to secure insulation to decking shall be approved the insulation manufacturer for the system specified.
  - 1. The same brand fastener is to be used throughout the work.
  - 2. Number of fasteners and layout will be recommended by the manufacturer and as per FM Approval Guide for I 90 wind uplift. Install additional fasteners as directed in the field by the Architect.
  - 3. Length of fastener shall be determined by the thickness of the decking and may vary with the thickness of the insulation. Fasteners shall be appropriate lengths to achieve a minimum of 1-inch penetration. Contractors shall ensure that fasteners do no penetrate roof deck to exposed interior.
  - 4. The Sopra-fix fastener and plate shall be used in all areas for attachment of the base ply. The length of the fastener shall be determined by the thickness of the insulation allowing for a 1 inch penetration into the deck.
  - 5. Over concrete decks, alternate methods of fastening insulation may be used, provided they comply with manufacturer's tested assemblies for FM approval.

#### 2.05 WOOD BLOCKING

- A. All nailers and blocking material to be free of wane, shake, decay or checks, and pressure treated with water-borne preservatives for above ground use, AWPB LB-2.
  - 1. Blocking shall not be less than Construction Grade, Southern Pine.
  - 2. Provide manufacturer=s recommended protection between blocking for equipment, piping, and conduit supports above roof.

#### 2.06 ROOF INSULATION

- A. Polyisocyanurate Board Insulation: Rigid cellular thermal insulation with glass-fiber reinforced polyisocyanurate closed-cell foam core and asphalt/glass fiber felt facing laminated to both side; complying with Federal Specification HH-I-1972/2; aged R-value of 5.56 at 75°F respectively.
- B. Mechanical Anchors: As recommended by insulation manufacturer for deck type, and complying with fire and insurance requirements.
- C. Verify insulation furnished is compatible with and suitable for the specified roofing system, including roofing condition, installation procedures and type of membrane to be used.
- D. Insulation is to be installed in two staggered layers with a total thickness of 4" (not including tapered saddles).
- E. Saddles and crickets, overlayment and bonding substrate: same as specified in Article 2.06-C. Overlayment and insulation combination must meet UL1256 and manufacturer's requirements for warranty.

2.07 PRIMER

- A. Asphalt Primer: ELASTOCOL 500
  - 1. Primer shall be applied on all dissimilar materials except insulation, as required by manufacturer.
  - 2. Description: Back bituminous varnish.
  - 3. Composition: Asphalt modified bitumen with thermoplastic polymers and volatile solvents.

2.08 MISCELLANEOUS

- A. Water Cut-Off Mastic: Sopracolle or Sopramastic
- B. Sopralene Flam 180 for gusset material (flashing).
- C. Walk pads: Sopralene Flam 180 Granules, color as selected by Architect from Manufacturer's Standards.

PART 3 - EXECUTION

3.01 SURFACE INSPECTION AND PREPARATION

- A. Before commencing work, all surfaces shall be smooth, clean, dry and free of any debris that would adversely effect the installation of the membrane.
- B. Verify that the work of other trades has been properly completed.
- C. Do not install materials in conditions of inclement weather.

3.02 SURFACE PREPARATION

- A. Remove all existing roofing and insulation. Clean all flutes of debris.
  - 1. Replace damaged or defective areas prior to commencement of work under this section.

3.03 INSTALLATION

- A. Maintain all equipment and tools in good working order.

3.04 ASPHALT PRIMER APPLICATION

- A. Prime all dissimilar surfaces to which asphalt or membrane will come in contact, or is to be fully bonded by torching. Apply at the rate of 150-200 sq. ft./gallon. Coat all metal flashings and fascia with primer, which will come in contact with membrane.

3.05 INSULATION APPLICATION

- A. Install roof insulation in two layers, two inches per layer, with joints staggered. Install overlayment over insulation and fasten at a rate to meet specified uplift requirements. Fasteners must meet an average pullout of 300 lbs. Insulation must be kept dry. Remove any isocyanurate insulation and overlayment which becomes wet.

3.06 BASE PLY FASTENING REQUIREMENTS

- A. Maximum Design Pressures
  - 1. -45 PSF or  $\leq$  Soprafix Density = 18" O.C./Soprafast Density = 24" O.C.
  - 2. -60 PSF or  $\leq$  Soprafix Density = 12" O.C./Soprafast Density = 18" O.C.

- B. Exposure Categories A, B, C, and D for structures less than 200' in elevation

	PARAPET OF 3" OR LESS		PARAPET OF 3" OR GREATER	
	Perimeter + curbs 3' or < Parapet	Corners	Perimeter + Curbs 3' or > Parapet	Corner
A Exposure	(ASCE 7-93 Calculation needed)	(ASCE 7-93 Calculation needed)	See B Exposure Category	See B Exposure Category
B Exposure	A	A	50% increase	100% increase
C Exposure	A	A	(ASCE 7-93	(ASCE 7-93
D Exposure	A	A	Calculation is req=d)	Calculation is req=d)

- C. Penetrations and Drains require the use of 3 head lap fasteners in field areas. Target must be installed around penetration/drain and fastened in all four directions within 3' x 3' area.
- D. Curbs are to be treated as perimeters for density protocol. Area must assume a minimum of a 3' dimension from edge of curb out onto the field areas.

3.07 FIELD BASE MEMBRANE PLY INSTALLATION

- A. Install per manufacturer's warranty requirements.
- B. Install fasteners as required to meet specified uplift requirement and manufacturer's warranty.

3.08 BASE PLY FLASHING INSTALLATION

- A. Install primer as required by roof membrane manufacturer.
- B. Install membrane per manufacturer's warranty requirements.

3.09 FIELD CAP MEMBRANE PLY INSTALLATION

- A. Once the FIELD BASE MEMBRANE PLY AND FIRST MEMBRANE FLASHING PLY are applied and do not show any defects, install field cap membrane ply, per manufacturer's warranty requirements.
- B. Do not burn the membranes and their respective reinforcements.
- C. Field cap membrane ply shall have side laps of three (3) inches and end laps of six (6) inches. Prior to installation of following ply, embed surface granules on laps by torch heating the membrane surface and pressing the granules into the melted asphalt with a hot trowel.
- D. Insure the two membranes are perfectly welded, without air pockets, wrinkles, fishmouths or tears.
- E. After installation of the field cap membrane ply, check all lap seams on the top ply using the edge of a hot trowel. Correct any defects.
- F. During installation, avoid asphalt seepage greater than 1/4 inch at seams.
  - 1. Cover any asphalt seepage with a sprinkling of loose granules, color to match membrane.

3.10 TOP PLY FLASHING INSTALLATION

- A. Install per manufacturer's warranty requirements.
- B. Do not burn the membrane or their respective reinforcements.
- C. Thoroughly seal all voids in the corners and seams.
- D. Applications shall provide a smooth surface, free of air pockets, wrinkles, fishmouths or tears.
- E. During installation avoid asphalt seepage greater than 1/4 inch at seams.
- F. Insure the two membranes are perfectly welded, without air pockets, wrinkles, fishmouths or tears.
- G. After installation of the top ply, check all lap seams on the top ply using the edge of a hot trowel. Correct any defect.

3.11 WATER CUT-OFF

- A. At the end of the day's work, and when precipitation is eminent, a water cut-off shall be constructed at all open edges. Construct the cut-off with the same membrane and asphalt that is used for the roofing system. Cut off must be able to withstand extended periods of wet weather. The water cut-off shall be completely removed prior to resuming the installation of the roofing system.

3.12 CLEAN UP

- A. Clean up and remove daily from the site all wrappings, empty containers, paper, loose particles and other debris resulting from these operations. Do not allow any material into roof drains, gutters and downspouts.
- B. Remove asphalt markings from finished surfaces.
- C. Repair or replace defaced or disfigured finishes caused by work of this section.

3.13 PROTECTION

- A. Provide traffic ways, erect barriers, fences, guards, rails, enclosures, chutes and the like to protect personnel, roofs, structures, vehicles and utilities.
- B. Plywood for traffic ways required for material movement over existing roofs shall be not less than 5/8 inch thick.
- C. In addition to the plywood listed above, an underlayment of minimum 1/2 inch recover board is required on new roofing.
  - 1. Special permission must be obtained from the manufacturer before any traffic will be permitted over new roofing.

3.14 FIELD CONTROL

- A. Field inspection will be performed as outlined under 1.10 of this section.

3.15 ROOF DRAINS

- A. Provide a smooth transition from drain bowl to deck surface.
  - 1. Taper insulation back from drain a minimum of 18 inches on each side (36" x 36") to

- provide for positive drainage.
  2. Prime all metal surfaces.
  3. Using a trowel, set a 6 inch wide layer of mastic around the drain bowl edge as water cut-off.
  4. Provide additional fasteners at drain to prevent movement of drain on deck.
- B. Install base ply membrane with lap centered on bowl and as specified under 3.07 of this section ensuring a tight seal at drain.
1. Install fully primed, 30-inch square sheet of 4-lb lead flashing set in mastic.
  2. Torch into place reinforcing sheets of ply material three feet square centered on drain.
  3. Extend membrane 1 inch beyond the inside edge of the drain bowl and temporarily secure with clamping ring.
- C. Install top ply as specified under 3.09 of this section.
1. Extend membrane 1 inch beyond the inside edge of the drain bowl.
  2. Position membranes so as to avoid the occurrence of any seams at drains.
  3. Seal off drain by running a hot trowel along the edge and firmly pressing against the rim.
- D. Install clamping rings and drain covers supplied with drain.
- E. Test all drains for proper flow and watertightness. Correct defects.

3.16 VENT (STACK)

- A. Inspect base ply installation and ensure tight seal around pipe.
- B. Construct and install over base ply a sheet metal vent sleeve with welded or soldered seams and as per details, and manufacturer's warranty requirements.

3.17 CORNER FLASHING

- A. Install reinforcement at gussets at all corners. Comply with manufacturer's warranty requirements.

3.18 CURBS

- A. Inspect and verify that all curbs are properly secured to deck, are level, a minimum 8 inches above insulation/overlayment, primed and ready to receive flashings. Shim as required with preservative treated lumber.
- B. Install flashing per details and manufacturer's warranty requirements.
- C. Install gussets at all corners.
- D. Provide metal counter flashing and termination bars as required.

3.19 ROOF EDGE

- A. Install base ply membrane as specified under 3.07 of this section. Carry membrane over roof edge a minimum of 3 inches and temporarily fasten using galvanized roofing nails.
- B. Install a continuous metal cleat (material) and edge as detailed.
  1. Prime all dissimilar surfaces prior to membrane or flashing installation.
  2. Flange on edge to be 4-inch minimum.
  3. Nail flange to decking or wood blocking at 4-inch center, staggered, 1 inch from outside edge.



- C. Cover edge with a reinforcing strip of base membrane torched into place. Membrane is to carry beyond the metal flange onto base ply a minimum of 4 inches.
  - 1. Hold the reinforcing strip back from outside edge of metal by 3/4 inch.
  - 2. Seal all edges with a hot trowel.
  
- D. Install top ply of membrane according to 3.09 of this section with the edge tight against the metal and sealed with a hot trowel.

3.20 WALK PADS

- A. Install walk pads as shown on drawings, or if not shown, around all rooftop mechanical and electrical equipment, hatches, and ladders.

END OF SECTION 07 52 16.01

SECTION 07 92 00 - JOINT SEALERS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. The extent of each form and type of joint sealer as indicated on the Drawings and specified herein.
- B. Types of joint sealants specified herein include:
  - 1. Elastomeric Sealants.
  - 2. Non-Elastomeric Sealants and Caulking Compounds.
- C. In general, all joints are to have joint sealers, including but not limited to the following:
  - 1. Flashing and coping joints.
  - 2. Interior equipment joints.
  - 3. Joints between dissimilar materials.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Refer to sections of Division 22, 23 and 26 for joint sealers in mechanical and electrical work.

1.03 QUALITY ASSURANCE

- A. Except as otherwise indicated, joint sealers are required to establish and maintain airtight and waterproof continuous seals on a permanent basis, within recognized limitations of wear and aging as indicated for each application. Failures of installed sealers to comply with this requirement will be recognized as failures of materials and workmanship.

1.04 SUBMITTALS

- A. Product Data:
  - 1. Submit manufacturer's product specifications, handling/installation/curing instructions and performance tested data sheets for each elastomeric product required.
  - 2. Submit certified test reports for elastomeric sealants on aged performances as specified, including hardness, stain resistance, adhesion, cohesion or tensile strength, elongation, low-temperature flexibility, compression set, modulus of elasticity, water absorption, and resistance (aging, weight loss, deterioration) to heat and exposures to ozone and ultraviolet light.
- B. Samples:
  - 1. Submit color charts for selection.
  - 2. Colors to be selected by Architect from manufacturer's entire selection.
  - 3. Multiple colors may be selected for differing substrates and/or conditions throughout the project.

1.05 JOB CONDITIONS

- A. Do not proceed with installation of liquid sealants under unfavorable weather conditions. Install elastomeric sealants when temperature is in lower third of temperature range recommended by manufacturer for installation.

1.06 WARRANTY

- A. The Contractor shall provide a warranty against failure of sealant materials and workmanship including replacement of other materials damaged as a result of sealant failure for five (5) years from the date of Substantial Completion. Typical for all sealants at all locations and conditions, unless otherwise indicated.

PART 2 - PRODUCTS

2.01 GENERAL

- A. General Sealer Requirements:
1. Select materials for compatibility with joint surfaces and other indicated exposures, and except as otherwise indicated, select modulus of elasticity and hardness or grade recommended by manufacturer for each application indicated.
  2. Where exposed to foot traffic, select non-tracking materials of sufficient strength and hardness to withstand "stiletto" heel traffic without damage or deterioration of sealer system.
  3. Provide colors as selected by Architect from the manufacturer's entire available color selection. Colors are to be selected for each differing material and condition. Various colors of each product are to be expected.

2.02 ACCEPTABLE MANUFACTURERS

- A. Provide products, as approved by the Architect, by one of the following approved manufacturers:
1. Manufacturers of Elastomeric Sealants (Liquid):
    - a. "Sonneborn / BASF Building Systems"
    - b. "Tremco, Inc."
    - c. "Capital Services"
    - d. "DOW Corning"
  2. Manufacturers of Non-Elastomeric Sealants (Liquid/Tape):
    - a. "Sonneborn / BASF Building Systems"
    - b. "Tremco, Inc."
    - c. "Capital Services"
    - d. "DOW Corning"
  3. Manufacturers of Joint Fillers/Sealant Backers:
    - a. "Sonneborn / BASF Building Systems"
    - b. "Backer Rod Mfr. & Supply Co."
    - c. "Williams Products, Inc."

2.03 ELASTOMERIC SEALANTS

- A. For use at interior/exterior joints subject to movement: control joints, expansion joints, etc.
- B. Multi-Component Polyurethane Sealant: Except as otherwise indicated, provide manufacturer's standard, non-modified, 2-or-more-part, polyurethane-base, elastomeric sealant; complying with ASTM C920 Type M Class 25, non-sag grade/type.
- C. Modulus and Hardness: Where self-leveling grade/type is required, provide sealant with cured modulus of elasticity at 100% elongation of not more than 150 psi (ASTM D 412 test procedure), and Shore A hardness of not less than 55 (ASTM D 2240). Where non-sag grade/type is required, provide sealant with cured modulus of elasticity at 100% elongation of not more than 75 psi and Shore A hardness of 20 to 30.
- D. Tear Resistance: Not less than 50 lb. per inch (ASTM D 624).
- E. Acceptable Products:
1. "Sonneborn", Sonolastic NP 1.
  2. "Sonneborn", Sonolastic NP 2.
  3. "Sonneborn", Sonolastic SL I.
  4. "Tremco", Dymeric.

2.04 NON-ELASTOMERIC SEALANTS AND CAULKING COMPOUNDS

- A. For general use as an exposed building construction sealant provide acrylic terpolymer, solvent-based, one-part, thermo-plastic sealant compound; solids not less than 95% acrylic.
- B. Performance Standard: Comply with either ASTM C 920 Type S Class 12-1/2 Grade NS or Class B Type Non-Sag.
- C. Bond and Cohesion: Comply with ASTM C 910, with less than 0.50 square inches of combined cohesion and bond failure for three (3) samples.
- D. Acceptable Products:
  - 1. "Sonneborn", Sonolac.
  - 2. "Tremco", Mono.

2.05 MISCELLANEOUS MATERIALS

- A. Joint Primer/Sealer:  
Provide type of joint primer/sealer recommended by sealant manufacturer for joint surfaces to be primed or sealed.
- B. Bond Breaker Tape:  
Provide Polyethylene tape or other plastic tape as recommended by sealant manufacturer; to be applied to sealant-contact surfaces where bond to substrate or joint filler must be avoided for proper performance of sealant. Provide self-adhesive tape where applicable.
- C. Sealant Backer Rod:  
Provide compressible rod stock of polyethylene foam, polyurethane foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable non-absorptive material as recommended by sealant manufacturer for back-up of, and compatibility with sealant.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Examine substrates, (joint surfaces) and conditions under which joint sealer work is to be performed. Do not proceed with joint sealer work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Clean joint surfaces immediately before installation of sealants. Remove dirt, insecure coating, moisture and other substrates which could interfere with bond of sealant. Etch concrete and masonry joint surfaces as recommended by sealant manufacturer. Roughen vitreous and glazed joint surfaces as recommended by sealant manufacturer.
- B. Set joint filler units at depth or position in joint as indicated to coordinate with other work, including installation of bond breakers, backer rods and sealants. Do not leave voids or gaps between ends of joint filler units.
- C. Install sealant backer rod for liquid-applied sealants, except where shown to be omitted or recommended to be omitted by sealant manufacturer for application indicated. Install backer rod at all areas required for proper installation of sealant.
- D. Install backer rods at any location necessary for proper installation of all sealants, whether shown on drawings or not.

- E. Install bond breaker tape where indicated and where required by manufacturer's recommendations to insure that liquid-applied sealants will perform as intended.
- F. Employ only proven installation techniques, which will insure that sealants are deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of joint bond surfaces equally on opposite sides. Except as otherwise indicated, fill joints with sealant to a slightly concave surface slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and vertical surfaces, fill joint to form a slight cove, so that joint will not trap moisture and dirt.
- G. Install liquid applied sealant to depths as shown or, if not shown, as recommended by sealant manufacturer but within the following general limitations:
  - 1. For normal moving joints sealed with elastomeric sealants but not subject to traffic, fill joints to a depth equal to 50% of joint width, but neither more than 1/2 inch deep nor less than 1/4 inch deep.
  - 2. For joints sealed with non-elastomeric sealants and caulking compounds, fill joints to a depth in range of 75% to 125% of joint width.
- H. Do not allow sealants or compounds to overflow from confines of joints, or to spill onto adjoining work, or to migrate into voids of exposed finishes. Clean adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage.
- I. Do not overheat or reheat hot-applied sealants.

3.03 PROTECTION

- A. Cure sealant compounds in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability.
- B. Protect joint sealers during construction period, so that they will be without deterioration or damage (other than normal wear and weathering) at time of substantial completion. Replace or restore sealants which are damaged or deteriorated during construction period.

SUBMITTAL CHECK LIST

- 1. Product Data.
- 2. Warranty.

END OF SECTION 07 92 00

SECTION 09 51 13 - ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Temporary removal and replacement of ceilings shown on the Drawings.
- B. Types of acoustical ceilings specified in this Section include the following:
  - 1. Acoustical panel ceilings, exposed grid suspension.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Provide ceiling panels, as approved by the Architect, by one of the following manufacturers:
  - 1. "Armstrong"
  - 2. "U.S. Gypsum" (USG)
  - 3. "Celotex"
  - 4. "National Gypsum Company" (NGC)
  - 5. "Certainteed"
- B. Provide suspension systems from same manufacturer as the ceiling panel, as approved by the Architect, or by one of the following manufacturers:
  - 1. "Armstrong"
  - 2. "U.S. Gypsum/Donn Ceilings"
  - 3. "Chicago Metallic Corporation"

2.02 CEILING SYSTEMS

- A. Match existing grid and panel

PART 3 - EXECUTION

3.01 PREPARATION

- A. Review with mechanical contractor all areas where ceiling removal will be required.

3.02 TEMPORARY REMOVAL

- A. Carefully remove existing ceiling panels and store on-site. Generally in the same room where they were removed to minimize handling and damage.
- B. Carefully remove ceiling grid as required for removal of existing HVAC equipment and new equipment. Grid not damaged during removal may be stored on-site and reinstalled. Damaged grid to be replaced with new grid.

3.03 RE-INSTALLATION

- A. Re-install grid after completion of HVAC work with care to not damage existing ceiling system.
- B. Re-install all acoustical units in pattern to match existing.

3.04 ADJUST AND CLEAN

- A. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members; comply with manufacturer's instructions for cleaning and touch-up of minor finish damage.

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- B. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 13

**SECTION 20 01 00 - GENERAL PROVISIONS - MECHANICAL**

**PART 1 – GENERAL:**

- 1.1 The Advertisement for Bid, Instructions to Bidders, Bidding Requirements, General, Special and Supplementary Conditions, and all other Contract Documents shall apply to the Contractor's work as well as to each of their Sub-Contractor's work.
- 1.2 All manufacturers, suppliers, fabricators, contractors, etc. submitting proposals for any part of the work, services, materials, or equipment to be used on or applied to this project are hereby directed to familiarize themselves with the Contract Documents. In case of conflict between these General Provisions and the General and/or Special Conditions, the Contractor shall contact the Engineer for clarification and final determination prior to the Bid.
- 1.3 The work included in this Division consists of the furnishing of all labor, equipment, transportation, excavation, backfill, supplies, material, appurtenances, and services necessary for the satisfactory installation of the complete and operating Mechanical Systems indicated or specified in the Contract Documents.
- 1.4 Any materials, labor, equipment, or services not mentioned specifically herein which may be necessary to complete any part of the Mechanical Systems in a substantial manner, in compliance with the requirements stated, implied, or intended in the Plans and/or Specifications, shall be included in the Bid as part of this Contract.
- 1.5 It is not the intent of this Section of the Specifications to make any Contractor, other than the Prime Contractor responsible to the Owner. All transactions such as submittal of shop drawings, claims for extra costs, requests for equipment or materials substitution, shall be routed through the General Contractor to the Architect, then to the Engineer. Also, this Section of the Specifications shall not be construed as an attempt to arbitrarily assign responsibility of work, material, equipment or services to a particular trade or Contractor. Unless stated otherwise, the subdivision and assignment of work under the various sections shall be optional.
- 1.6 The Architect and Engineer do not define the scope of individual trades, subcontractors, material suppliers and vendors. Any sheet numbering system or specification numbering system used which identifies disciplines is solely for the Architect and Engineer's convenience and is not intended to define a subcontractor's scope of work. Information regarding individual trades, subcontractors, material suppliers and vendors may be detailed, described, and indicated at different locations throughout the Contract Documents. No consideration will be given to requests for change orders for failure to obtain and review the complete set of Contract Documents when preparing Bids, prices, and quotations. Unless stated otherwise, the subdivision and assignment of work under the various sections shall be the responsibility of the Contractor holding the prime contract.
- 1.7 It is the intent of the Contract Documents to deliver to the Owner a new, complete, and operational project once the work is complete. Although Plans and Specifications are complete to the extent possible, it shall be the responsibility of the Contractors involved to remove and/or relocate or re-attach any existing or new systems which interfere with new equipment or materials required for the complete installation without additional cost to the Owner.



- 1.8 In general, all work shall be accomplished without interruption of existing facilities operations. The Contractor shall advise the Owner at least seven (7) days prior to the interruption of any services (gas, domestic water, heating, etc.). The Owner shall be advised of the exact time that interruption will occur and the length of time the interruption will last. Failure to comply with this requirement may result in complete work stoppage for the Contractors involved until a complete schedule of interruptions can be developed.
- 1.9 Whenever utilities are interrupted, either deliberately or accidentally, the Contractor shall work continuously to restore said service. The Contractor shall provide tools, materials, skilled journeymen of Bidder/Proposer's own and other trades as necessary, premium time as needed and coordination with all applicable utilities, including payment of utility company charges (if any), all without requests for extra compensation from the Owner.
- 1.10 Each Bidder/Proposer shall also be governed by any unit prices and Addenda insofar as they may affect part of their work or services.
- 1.11 DEFINITIONS AND ABBREVIATIONS:
- Contractor - Any Contractor whether bidding, proposing, or working independently or under the supervision of a General Contractor, Prime Contractor, Construction Manager and who installs any type of Mechanical Work as specified in the Contract Documents or, the General Contractor.
  - Engineer - The Consulting Mechanical-Electrical Engineer either consulting to the Owner, Architect, or Other, etc. In this case: CMTA, Inc., Consulting Engineers.
  - Architect - The Architect of Record for the project.
  - Contract Documents - All documents pertinent to the quality and quantity of work to be performed on this project. Includes, but not limited to: Plans, Specifications, Instructions to Bidders, General and Special Conditions, Addenda, Alternates, Lists of Materials, Lists of Sub-Contractors, Unit Prices, Shop Drawings, Field Orders, Change Orders, Cost Breakdowns, Schedules of Value, Periodical Payment Requests, Construction Contract with Owner, etc.
  - Bidder/Proposer - Any person, agency or entity submitting a proposal to any person, agency, or entity for any part of the work required under this contract.
  - The Project - All of the work required under this Contract.
  - Furnish - Deliver to the site in good condition and turn over to the Contractor who is to install.
  - Provide - Furnish and install complete, tested, and ready for operation.
  - Install - Receive and place in satisfactory operation.
  - Indicated - Listed in the Specifications, shown on the Plans or Addenda thereto.
  - Typical or Typ.- Where indicated repeat this work, method or means each time the same or similar condition occurs whether indicated or not.
  - ADA - Americans with Disabilities Act.
  - AGA - American Gas Association.
  - ANSI - American National Standards Institute.
  - ASHRAE - American Society of Heating, Refrigeration and Air Conditioning Engineers.
  - ASME - American Society of Mechanical Engineers.
  - IBC - International Building Code.
  - NEC - National Electrical Code.
  - NEMA - National Electrical Manufacturers Association.
  - NFPA - National Fire Protection Association.
  - OSHA - Office of Safety and Health Administration.
  - SMACNA - Sheet Metal and Air Conditioning Contractors National Association.
  - UL - Underwriters Laboratories.

**PART 2 – INTENT AND INTERPRETATION:**

- 2.1 It is the intention of the Contract Documents to call for a complete and operational system, including all components, accessories, finish work, etc as necessary for trouble free operation, tested and ready for operation. Anything that may be required, implied, or inferred by the Contract Documents shall be provided and included as part of the Bid.
- 2.2 All Contractors and Vendors providing a bid for this project shall review the Plans and Specifications and determine any modifications and/or adjustments necessary relative to the proposed equipment and materials with specific manufacturer's installation requirements. Include in the bid any necessary installation methods, features, options, accessories, etc. necessary to install the proposed equipment and materials, regardless of whether used as basis of design or being offered as a substitution in accordance with the specific manufacturer's installation requirements whether specifically detailed or not within the Plans and Specifications.
- 2.3 Details not usually shown or specified, but necessary for the proper installation and operation of systems, equipment, materials, etc., shall be included in the work, the same as if herein specified or indicated.
- 2.4 The Bidder/Proposer shall completely review the Contract Documents. Any interpretation as to design intent or scope shall be provided by the Engineer / Architect. Should an interpretation be required, the Bidder/Proposer shall request a clarification not less than ten (10) days prior to the submission of the proposal so that the condition may be clarified by Addendum. In the event of any conflict, discrepancy, or inconsistency develops; the interpretation of the Engineer shall be final.
- 2.5 The Contractor shall give written notice of any materials or apparatus believed inadequate or unsuitable; in violation of laws, ordinances, rules, or regulations of authorities having jurisdiction; and any necessary items of work omitted a minimum of ten (10) days prior to bid. In the absence of such written notice and by the act of submitting a bid, it shall be understood that the Contractor has included the cost of all required items in the bid, and that will be responsible for the approved satisfactory functioning of the entire system without extra compensations.

**PART 3 – INDEMNIFICATION:**

- 3.1 The Contractor shall hold harmless and indemnify the Engineer, employees, officers, agents and consultants from all claims, loss, damage, actions, causes of actions, expense and/or liability resulting from, brought for, or on account of any personal injury or property damage received or sustained by any person, persons, (including third parties), or any property growing out of, occurring, or attributable to any work performed under or related to this contract, resulting in whole or in part from the negligence of the Contractor, any subcontractor, any employee, agent or representative.

**PART 4 – PLANS AND SPECIFICATIONS:**

- 4.1 The Plans are diagrammatic only and indicate the general arrangement of the systems and are to be followed. If deviations from the layouts are necessitated by field conditions, detailed layouts of the proposed departures shall be submitted to the Engineer for approval before proceeding with the work. The Plans are not intended to show every item which may be necessary to complete the systems. All Bidder/Proposers shall anticipate that additional items may be required and submit their Bid accordingly.

- 4.2 The Plans and Specifications are intended to supplement each other. No Bidder/Proposer shall take advantage of conflict between them, or between parts of either. Should this condition exist, the Bidder/Proposer shall request a clarification not less than ten (10) days prior to the submission of the proposal so that the condition may be clarified by Addendum. In the event that such a condition arises after work is started, the interpretation of the Engineer shall be final.
- 4.3 The Plans and Specifications shall be considered to be cooperative and anything appearing in the Specifications which may not be indicated on the Plans or conversely, shall be considered as part of the Contract and must be executed the same as though indicated by both.
- 4.4 Contractor shall make all of their own measurements in the field and shall be responsible for correct fitting. The work shall be coordinated with all other branches of work in such a manner as to cause a minimum of conflict or delay.
- 4.5 The Engineer shall reserve the right to make adjustments in location of piping, ductwork, equipment, etc. where such adjustments are in the interest of improving the project.
- 4.6 Should conflict, overlap or duplication of work between the various trades become evident, this shall be called to the attention of the Engineer. In such event neither trade shall assume to be relieved of the work which is specified under their branch until instructions in writing are received from the Engineer.
- 4.7 Unless dimensioned, the Plans only indicate approximate locations of equipment, piping, ductwork, etc. Dimensions given in figures on the Plans shall take precedence over scaled dimensions and all dimensions, whether given in figures or scaled, shall be verified in the field to ensure no conflict with other work.
- 4.8 Each Bidder/Proposer shall review all Plans in the Contract Documents to ensure that the work they intend to provide does not create a conflict with or affect the work of others in any way. Where such effect does occur, it shall be the Bidder/Proposer's responsibility to satisfactorily eliminate any such conflict or effect prior to the submission of their proposal. Each Bidder/Proposer shall in particular ensure that there is adequate space to install their equipment and materials. Failure to do so shall result in the correction of such encroachment conflict or effect of any work awarded the Bidder/Proposer and shall be accomplished fully without expense to others and that they are reasonably accessible for maintenance. Check closely all mechanical and electrical closets, chases, ceiling voids, wall voids, crawl spaces, etc., to ensure adequate spaces.
- 4.9 Where on the Plans a portion of the work is drawn out and the remainder is indicated in outline, or not indicated at all, the parts drawn out shall apply to all other like portions of the work. Where ornamentation or other detail is indicated by starting only, such detail shall be continued throughout the courses or parts in which it occurs and shall also apply to all other similar parts of the work, unless otherwise indicated.
- 4.10 Details not usually shown or specified, but necessary for the proper installation and operation of systems, equipment, materials, etc., shall be included in the work, the same as if herein specified or indicated.
- 4.11 Where within the Contract Documents the word "typical" or "typ." is used, it shall mean that the work method or means indicated as typical shall be repeated in and each time it occurs whether indicated or not.

- 4.12 Each Contractor shall evaluate ceiling heights specified on Architectural Plans. Where the location of equipment or systems may interfere with ceiling heights or maintenance and access of equipment or systems, the Contractor shall call this to the attention of the Engineer in writing prior to making the installation. Do not install equipment or systems in the affected area until the conflict is resolved. Any such changes shall be anticipated and requested sufficiently in advance so as to not cause extra work or cost incurred on the part of the Contractor or unduly delay the work.

**PART 5 – EXAMINATION OF SITE AND CONDITIONS:**

- 5.1 Each Bidder/Proposer shall inform themselves of all of the conditions under which the work is to be performed, the site of the work, the structure of the ground, above and below grade, the obstacles that may be encountered, the availability and location of necessary facilities and all relevant matters concerning the work.
- 5.2 Each Bidder/Proposer shall also fully acquaint themselves with all existing conditions as to ingress and egress, distance of haul from supply points, routes for transportation of materials, facilities and services, availability of utilities, etc. A proposal shall cover all expenses or disbursements in connection with such matters and conditions. No allowance will be made for lack of knowledge concerning such conditions after Bids are accepted.

**PART 6 – EQUIPMENT AND MATERIALS SUBSTITUTIONS OR DEVIATIONS:**

- 6.1 When any Contractor requests approval of materials and/or equipment of different physical size, weight, capacity, function, color, access, than the design allows for it shall be understood that such substitution, if approved, will be made without additional cost to anyone other than the Contractor requesting the change regardless of changes in connections, space requirements, electrical characteristics, etc. from that indicated, electrical service, etc. In all cases where substitutions affect other trades, the Contractor requesting such substitutions shall advise all such Contractors of the change and shall compensate them for all necessary changes in their work. Any Plans, Specifications, Diagrams, etc., required to describe and coordinate such substitutions or deviations shall be professionally prepared at the responsible Contractor's expense. Review of Shop Drawings by the Engineer does not in any way absolve the Contractor of this responsibility.
- 6.2 Notwithstanding any reference in the Specifications to any article, device, product, material, fixture, form, or type of construction by name, make or catalog number, such reference shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition; any devices, products, materials, fixtures, forms, or types of construction which, in the judgment of the Engineer, are equivalent to those specified are acceptable, provided the provisions of this Part are met. Requested substitutions shall be submitted to the Engineer a minimum of ten (10) days prior to Bid. If this procedure is not followed, the substitution will be rejected. If prevailing laws of cities, towns, states, or countries are more stringent than these specifications regarding such substitutions, then those laws shall prevail over these requirements.
- 6.3 Wherever any equipment and material are specified exclusively only such items shall be used unless substitution is accepted in writing by the Engineer.
- 6.4 Each Bidder/Proposer shall furnish along with their proposal a list of specified equipment and materials which is to be provided. Where several makes are mentioned in the Specifications and the Contractor fails to state which, they propose to furnish, the Engineer shall choose any of the makes mentioned without change in price. Inclusion in this list shall not ensure that the Engineer will approve shop drawings unless the equipment, materials, etc., submitted in shop drawings are satisfactorily comparable to the items specified and/or indicated.

**PART 7 – CODES, RULES, PERMITS, FEES, INSPECTIONS, REGULATIONS, ETC.:**

- 7.1 The Contractor shall give all necessary notices, obtain, and pay for all permits, government sales taxes, fees, inspections, and other costs, including all utility connections, meters, meter settings, taps, tap fees, extensions, etc. in connection with their work. They shall also file all necessary plans, prepare all documents, and obtain all necessary approvals of all governmental departments and/or the appropriate municipality or utility company having jurisdiction, whether indicated or specified or not. They shall also obtain all required certificates of inspection for their work and deliver same to the Engineer before request for acceptance and final payment for the work.
- 7.2 Ignorance of Codes, Rules, regulations, utility company requirements, laws, etc., shall not diminish or absolve Contractor's responsibilities to provide and complete all work in compliance with such.
- 7.3 The Contractor shall include in their work, without extra cost, any labor, materials, services, apparatus, and Plans in order to comply with all applicable laws, ordinances, rules, and regulations, whether or not indicated or specified.
- 7.4 All materials furnished and all work installed shall comply with the National Fire Codes of the National Fire Protection Association, with the requirements of local utility companies, or municipalities and with the requirements of all governmental agencies having jurisdiction.
- 7.5 All materials and equipment so indicated and all equipment and materials for the electrical portion of the mechanical systems shall bear the approval label of or shall be listed by the Underwriters' Laboratories (UL), Incorporated. Each packaged assembly shall be approved as a package. Approval of components of a package shall not be acceptable.
- 7.6 All plumbing work is to be constructed and installed in accordance with applicable codes, Plans and Specifications which have been approved in their entirety and/or reflect any changes requested by the Authority Having Jurisdiction. Plumbing work shall not commence until such Plans are in the possession of the Plumbing Contractor.
- 7.7 All Heating, Ventilation and Air Conditioning work shall be accomplished in accordance with the Building Code and amendments thereto, the latest standards recognized by the American Society of Heating, Refrigerating and Air Conditioning and the National Fire Protection Association.
- 7.8 The Contractor shall furnish three (3) copies of all Final Inspection Certificates obtained to the Engineer when work is complete. Final payment for work will be contingent upon compliance with this requirement.
- 7.9 Where minimum code requirements are exceeded in the Design, the Design shall govern.
- 7.10 The Contractor shall ensure that their work is accomplished in accord with the OSHA Standards and that they conduct their work and the work of their personnel in accord with same.
- 7.11 All work relating to the handicapped shall be in accord with regulations currently enforced by the Authority Having Jurisdiction and the American Disabilities Act.
- 7.12 All pressure vessel installations shall comply with the State, and/or Federal Code applicable. A Certificate of Final Boiler Inspection shall be required.
- 7.13 Work in elevators, elevator shafts and elevator equipment rooms shall comply with the Elevator Code enforced by the Authority Having Jurisdiction.

- 7.14 All work in conjunction with a natural gas installation shall, in addition to all other Codes, Rules, Regulations, Standards, etc., comply with the requirements of the local gas supplier and/or standards and recommendations of the American Gas Association.
- 7.15 All work in relation to domestic water systems shall, in addition to all other Codes, Rules, Regulations and Standards, be in compliance with the requirements of the local water utility company.
- 7.16 All work in relation to the installation of sanitary or storm sewers shall, in addition to all other Codes, Rules, Regulations and Standards, be in compliance with the local agency governing such installations.
- 7.17 Discharge of any toxic, odorous, or otherwise noxious materials into the atmosphere or any system shall be subject to regulations of the Environmental Protection Agency (EPA) and/or the air pollution control commission. If in doubt, contact the State Department for Environmental Protection.
- 7.18 Where conflict arises between any code and the Plans and/or Specifications, the code shall apply except in the instance where the Plans and Specifications exceed the requirements of the code. Any changes required as a result of these conflicts shall be brought to the attention of the Engineer at least ten (10) days prior to bid date, otherwise the Contractor shall make the required changes at their own expense.

**PART 8 – QUALIFICATIONS OF CONTRACTOR/WORKERS:**

- 8.1 All Mechanical Contractors and their subcontractors bidding this project must have been a licensed company for a minimum of three (3) years to qualify to Bid this project. Individual employee experience does not supersede this requirement.
- 8.2 All mechanical subcontractors bidding the mechanical work must have completed one project of 70% this subcontract cost size and two projects of 50% this subcontract cost size.
- 8.3 All mechanical work shall be accomplished by qualified workers competent in the area of work for which they are responsible. Untrained and incompetent workers, as evidenced by their workmanship, shall be summarily relieved of their responsibilities in areas of incompetency. The Engineer shall reserve the right to determine the quality of workmanship of any workers and unqualified or incompetent workers shall refrain from work in areas not deemed satisfactory. Requests for relief of workers shall be made through the normal channels of Architect, Contractor, etc.
- 8.4 The Contractor shall hold all required licenses in the State which the work is to be performed.
- 8.5 All plumbing work shall be accomplished by Journeymen Plumbers under the direct supervision of a Master Plumber as defined under State Plumbing Law Regulations and Code. Proof and Certification may be requested by the Engineer.
- 8.6 The installation of all Heating, Ventilating and Air-Conditioning Systems (HVAC) by any Contractor, whether in existing or new building construction shall be performed by a Licensed Master HVAC Contractor. This includes any Contractor installing HVAC systems, piping, and ductwork.
- 8.7 All sheet metal, insulation and pipe fitting work shall be installed by workers normally engaged in this type of work.

- 8.8 All automatic control systems shall be installed by workers normally engaged or employed in this type of work, except in the case of minor control requirements (residential type furnaces, packaged HVAC equipment with integral controls, etc.) in which case, if a competent worker is the employee of this Contractor, the worker may be utilized subject to review of their qualifications by the Engineer and after written approval from same.
- 8.9 All special systems (Medical Gases, Automatic Sprinkler Equipment, etc.) shall be installed only by workers normally engaged in such services. Exception to this specification may only be made in writing by the Engineer.
- 8.10 All electrical work shall be accomplished by Licensed Journeymen electricians under the direct supervision of a licensed Electrician. All applicable codes, utility company regulations, laws and permitting authority of the locality shall be fully complied with by the Contractor.

**PART 9 – SUPERVISION OF WORK:**

- 9.1 The Contractor shall personally supervise the work for which they are responsible or have a competent superintendent, approved by the Engineer, on the work at all times during progress with full authority to act on behalf of the Contractor.

**PART 10 – CONDUCT OF WORKERS:**

- 10.1 The Contractor shall be responsible for the conduct of all workers under their supervision. Misconduct on the part of any worker to the extent of creating a safety hazard, or endangering the lives and property of others, shall result in the prompt removal of that worker. The consumption of alcoholic beverages or other intoxicants, narcotics, barbiturates, hallucinogens, or rehabilitating drugs on the job site is strictly forbidden.

**PART 11 – COOPERATION AND COORDINATION WITH OTHER TRADES:**

- 11.1 The Contractor shall give full cooperation to all other trades and shall furnish in writing with copies to the Engineer, any information necessary to permit the work of other trades to be installed satisfactorily and with the least possible interference or delay.
- 11.2 Where any work is to be installed in close proximity to, or will interfere with work of other trades, each shall cooperate in working out space conditions to make a satisfactory adjustment. If so, directed by the Engineer, the Contractor shall prepare composite working drawings and sections at a suitable scale not less than  $\frac{1}{4}'' = 1'-0''$ , clearly indicating how their work is to be installed in relation to the work of other trades, or so as not to cause any interference with work of other trades. Make the necessary changes in the work to correct the condition without extra charge.
- 11.3 The Contractor shall furnish to other trades, as required, all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

**PART 12 – GUARANTEES AND WARRANTIES:**

- 12.1 The Contractor shall guarantee all equipment, apparatus, materials, and workmanship entering into their Contract to the best of its respective kind and shall replace all parts at their own expense, which are proven defective within the time frame outlined in the General Conditions of the Contract. The effective date of completion of the work shall be the date of the Project's Statement of Substantial Completion. Items of equipment which have longer guarantees, as called for in these Specifications, shall have warranties and guarantees completed in order, and shall be in effect at the time of final acceptance of the work by the Engineer. The Contractor shall present the Engineer with such warranties and guarantees at the time of final acceptance of the work. The Engineer shall then submit these warranties, etc. to the Owner. The Owner reserves the right to use equipment installed by the Contractor prior to date of final acceptance. Such use of equipment shall not invalidate the guarantee except that the Owner shall be liable for any damage to equipment during this period, due to negligence of their operator or other employees. Refer to other sections for any special or extra warranty requirements.
- 12.2 Provide all warranty certificates to Owner. All warranties begin starting at the substantial completion date, submit warranty certificates accordingly.

**PART 13 – COST BREAKDOWNS (SCHEDULE OF VALUES):**

- 13.1 Within thirty (30) days after acceptance of the Contract, the Contractor shall furnish to the Engineer, one copy of a detailed cost breakdown on each respective area of work. These cost breakdowns shall be made in a format approved by the Engineer. Payments will not be made until satisfactory cost breakdowns are submitted.

**PART 14 – CHANGES IN MECHANICAL WORK:**

- 14.1 REFER TO GENERAL AND SPECIAL CONDITIONS.

**PART 15 – CLAIMS FOR EXTRA COST:**

- 15.1 REFER TO GENERAL AND SPECIAL CONDITIONS.

**PART 16 – MATERIALS AND WORKMANSHIP:**

- 16.1 All equipment, materials and articles incorporated in the work shall be new and of comparable quality to that specified. Each Bidder/Proposer shall determine that the materials and/or equipment they propose to furnish can be brought into the building(s) and installed within the space available. In certain cases, it may be necessary to remove and replace walls, floors and/or ceilings and/or disassemble/reassemble the materials and equipment and this work shall be the responsibility of the Contractor, whether specifically initiated or not.
- 16.2 All equipment shall be installed so that all parts are readily accessible for inspection, maintenance, replacement of fans, motors, coils, filters, etc. Extra compensation will not be allowed for relocation of equipment for accessibility or for dismantling equipment to obtain entrance into the building(s). Ensure, through coordination that no other Contractor seals off access to space required for equipment materials, etc.
- 16.3 Materials and equipment shall bear Underwriters' Laboratories label where such a standard has been established, where applicable.
- 16.4 Each length of pipe, fitting, trap, fixture, and device used in the plumbing or drainage systems shall be stamped or indelibly marked with the weight or quality thereof and with the manufacturer's mark or name.



- 16.5 All equipment shall bear the manufacturer's name and address. All electrically operated equipment shall bear a name plate indicating required horsepower, voltage, phase, and ampacity. Pumps and fans shall have a data plate indicating horsepower, pressure, and flow rate.

**PART 17 – HAZARDOUS MATERIALS:**

- 17.1 No asbestos or mercury containing materials shall be installed in this project.

**PART 18 – TEMPORARY SERVICES:**

- 18.1 The Contractor shall arrange any temporary water, electrical and other services which may be required to accomplish the work. Refer also to General and Special Conditions.
- 18.2 All temporary services shall be removed by Contractor prior to completion of work.

**PART 19 – SURVEY, MEASUREMENTS AND GRADE:**

- 19.1 The Contractor shall lay out their work and be responsible for all necessary lines, levels, inverts, elevations, and measurements. The Contractor must verify the figures shown on the Plans before laying out the work and will be held responsible for any error resulting from failure to do so.
- 19.2 The Contractor shall base all measurements, both horizontal and vertical from established bench marks. All work shall agree with these established lines and levels. Verify all measurements at the site and check the correctness of same as related to the work.
- 19.3 Should the Contractor discover any discrepancy between actual measurements and those indicated which prevents following good practice or the intent of the contract documents, the Contractor shall promptly notify the Engineer and shall not proceed with this work until the Contractor has received instructions from the Engineer on the disposition of the work.

**PART 20 – PROTECTION OF EQUIPMENT:**

- 20.1 The Contractor shall be entirely responsible for all material and equipment they furnish in connection with their work and special care shall be taken to properly protect all parts thereof from damage during the construction period. Such protection shall be by a means acceptable to the Engineer. All piping, etc., shall be properly plugged or capped during construction in a manner approved by the Engineer. Equipment damaged, stolen, or vandalized while stored on site, either before or after installation, shall be repaired or replaced by the Contractor at their expense. All ductwork with open ends shall be covered with plastic during construction.

**PART 21 – REQUIRED CLEARANCES FOR ELECTRICAL EQUIPMENT:**

- 21.1 The NEC has specific required clearances above, in front, and around electrical gear, panels etc. The Contractor shall not install any piping, ductwork, etc., in the required clearance. If any appurtenance is located in the NEC required clearance, it shall be relocated at no additional cost. Coordinate with the Electrical Contractor prior to any work.

**PART 22 – EQUIPMENT SUPPORT:**

- 22.1 Each piece of equipment, apparatus, piping, or conduit suspended from the ceiling or mounted above the floor level shall be provided with suitable structural support, pipe stand, platform, or carrier in accordance with the best recognized practice. Such supporting or mounting means shall be provided by the Contractor for all equipment and piping. Exercise extreme care that structural members of building are not overloaded by such equipment. Provide any required additional bracing, cross members, angles, support, etc. Do not support items from roof/floor deck or bridging.

**PART 23 – DUCT AND PIPE MOUNTING HEIGHTS:**

- 23.1 All exposed or concealed ductwork, piping, etc., shall be held as high as possible unless otherwise noted and coordinated with all other trades. Exposed piping and ductwork shall, insofar as possible, run perpendicular or parallel to the building structure. Refer to Plans for minimum heights of ducts and piping. Minimum height above ceilings shall be 6" clear including insulation, unless otherwise noted.

**PART 24 – BROKEN LINES AND PROTECTION AGAINST FREEZING:**

- 24.1 No conduits, piping, etc. carrying water or any other fluid subject to freezing shall be installed in any part of the building where danger of freezing may exist without adequate protection being given by the Contractor whether or not insulation is specified or indicated on the particular piping. All damages resulting from broken and/or leaking lines shall be replaced or repaired at the Contractor's own expense. Do not install piping across or near openings to the outside whether or not they are carrying static or moving fluids. Insulation on piping does not necessarily ensure that freezing will not occur. If in doubt, contact the Engineer.

**PART 25 – WEATHERPROOFING:**

- 25.1 Where any work pierces waterproofing including waterproof concrete, the method of installation shall be as specified and approved by the Architect and Engineer before work is performed. The Contractor shall furnish all necessary sleeves, caulking and flashing required to make openings permanently watertight.
- 25.2 Wherever work penetrates roofing, it shall be done in a manner that will not diminish or void the roofing guarantee or warranty in any way. Coordinate all such work with the roofing installer.

**PART 26 – FINAL CONNECTIONS TO EQUIPMENT:**

- 26.1 The Contractor shall finally connect mechanical services (water, sanitary, gas, air, etc.), to any terminal equipment, appliances, kitchen equipment, etc., provided under this and/or other divisions of the work. Various equipment connections indicated are based upon "basis of design" equipment selections. Should alternate equipment be purchased by the General Contractor, then this Contractor shall make the necessary provisions in the Bid for any and all differences. Change Orders shall not be considered for any differences due to alternate equipment purchase. Such connections shall be made in strict accord with current codes, safety regulations and the equipment manufacturer's recommendations. If in doubt, contact the Engineer prior to installation.

**PART 27 – ACCESSIBILITY:**

- 27.1 The Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate clearance in double partitions and ceilings for the proper installation of their work. They shall cooperate with all others whose work is in the same space. Such spaces and clearances shall, however, be kept to the minimum size required.
- 27.2 The Contractor shall locate and install all equipment so that it may be serviced and maintained as recommended by the manufacturer. Allow ready access and removal of the entire unit and/or parts such as valves, filters, fan belts, motors, prime shafts, controls, coils, etc.
- 27.3 Whether shown on the Plans or not, the Contractor shall provide in the Bid access panels for each concealed shut-off valve, motorized control damper, manual air damper or other device requiring service as shown on Engineer's Plans or as required. Locations of these panels shall be identified in sufficient time to be installed in the normal course of work. Change orders for access panels will not be accepted.

**PART 28 – SCAFFOLDING, RIGGING AND HOISTING:**

- 28.1 The Contractor shall furnish all scaffolding, rigging, hoisting and services necessary for erection and delivery onto the premises of any equipment and apparatus furnished. All such temporary appurtenances shall be set up in strict accord with OSHA Standards and Requirements. Remove same from premises when no longer required.

**PART 29 – CONCRETE WORK:**

- 29.1 The Contractor shall be responsible for the provisions of all concrete work required for the installation of any of their systems or equipment. The Contractor may, at their option, arrange with the others to provide the work. This option, however, will not relieve the Contractor of their responsibilities relative to dimensions, quality of workmanship, locations, etc.
- 29.2 In the absence of other concrete Specifications, all concrete related to Mechanical work shall be 3500 psi minimum compression strength at 28 days curing, slump: 4" ± 1", air entrainment 4.5% water to cement ratio 0.5 and shall conform to the standards of the American Concrete Institute Publication AC1-318. Heavy equipment shall not be installed on pads for at least seven (7) days after pour.
- 29.3 All concrete pads shall be complete with all pipe sleeves, anchor bolts, reinforcing steel, concrete, etc. as required. Pads larger than 18" in width shall be reinforced with ½" deformed round bars on 6" centers both ways. Bars shall be approximately 2" above the bottom of the pad. All parts of pads and foundations shall be properly rodded or vibrated. If exposed parts of the pads and foundations are rough or show honeycomb after removing forms, all surfaces shall be rubbed to a smooth surface. Chamfer all vertical edges ¾" and tool horizontal edges with ¾" radius.
- 29.4 In general, unless otherwise noted, concrete pads for equipment shall be 4" thick, extend six (6) inches beyond the equipment's base dimensions. Where necessary, extend pads 30 inches beyond base or overall dimensions to allow walking and servicing space. Insert 6-inch steel dowel rods into new and existing floors to anchor pads.
- 29.5 Exterior concrete pads shall be 8" thick with four (4) inches minimum above grade and four (4) inches below grade on a compacted four (4) inch dense grade rock base unless otherwise indicated or specified. Surfaces of all foundations and bases shall have a smooth finish with one-half (½) inch chamfer on exposed edges. Turn down edges 18" below grade.

**PART 30 – RESTORATION OF NEW OR EXISTING LANDSCAPING, PAVING, SURFACES, ETC.:**

- 30.1 The Contractor shall at their expense restore to their original conditions all paving, curbing, surfaces, drainage ditches, structures, fences, landscaping, existing or new building surfaces and appurtenances, and any other items damaged or removed by their operations. Replacement and repairs shall be in accordance with good construction practice; by qualified tradesman and shall match materials employed in the original construction of the item and shall be to the satisfaction of the Owner and/or Engineer.

**PART 31 – MAINTENANCE OF EXISTING UTILITIES AND LINES:**

- 31.1 The locations of all piping, conduits, cables, utilities, and manholes existing, or otherwise, that comes within the contract construction site, shall be subject to continuous uninterrupted service with no other exception than the Owner of the utilities permission to interrupt same temporarily. Provide a seven (7) day written notice to Engineer, Architect and Owner prior to interrupting any utility service or line.
- 31.2 Known utilities and lines as available to the Engineer are shown on the Plans. However, it is additionally required that, prior to any excavation being performed, each Contractor ascertain and mark all utilities or lines that would be endangered by the excavation. Hand dig if required to locate. Contractor shall bear costs of repairing damaged utilities.
- 31.3 If utilities or lines occur in the earth within the construction site, the Contractor shall probe and locate the lines prior to machine excavation in the respective area. Hand dig if required to locate.
- 31.4 Cutting into existing utilities and services shall be performed in coordination with and as designated by the Owner of the utility. The Contractor shall work continuously to restore service(s) upon deliberate or accidental interruption, providing premium time and materials as needed without extra claim to the Owner.
- 31.5 The Contractor shall repair to the satisfaction of the Owner and Engineer, any surfaces or subsurface improvements damaged during the course of the work, unless such improvement is shown to be abandoned or removed.
- 31.6 Machine excavation shall not be permitted with ten feet of gas lines, fuel lines, electrical lines or lines carrying combustible and/or explosive materials. Hand excavate only in accord with utility company, agency or other applicable laws, standards or regulations.
- 31.7 Protect all new or existing lines from damage by traffic, etc. during construction. Repairs or replacement of such damage shall be at the sole expense of the party responsible.
- 31.8 Protect existing trees, indicated to remain with fencing or other approved method. Hold all new subsurface lines outside the drip line of trees, offsetting as necessary to protect root structures. Refer to planting or landscaping plans, or in their absence, consult with the Architect.

**PART 32 – CLEANING:**

- 32.1 The Contractor shall, at all times, keep the area of their work presentable to the public and clear from rubbish and debris caused by their operations; and at the completion of the work, they shall remove all rubbish, debris, all of their tools, equipment, temporary work, and surplus materials from and about the premises, and shall leave the area clean and ready for use. If the Contractor does not attend to such cleaning upon request, the Engineer may cause cleaning to be done by others and charge the cost of same to the Contractor. The Contractor shall be responsible for all damage from fire which originates in, or is propagated by, accumulations of their rubbish or debris.
- 32.2 After completion of all work and before final acceptance of the work, the Contractor shall thoroughly clean all equipment and materials and shall remove all foreign matter such as grease, dirt, plaster, labels, stickers, etc., from the exterior of piping, equipment, fixtures and all other associated or adjacent fabrication.
- 32.3 Ductwork and piping shall be kept clean at all times. Ductwork stored on the job site shall be placed a minimum of 4" above the floor and the open ends shall be completely covered in plastic. Open ends of installed ductwork shall be protected with plastic. Do not install the ductwork or insulation (pipe or duct) if the building is not "dried-in". The Owner/Engineer shall periodically inspect that these procedures are followed. If deemed unacceptable, the Contractor shall be required to clean the duct system utilizing a NADCA certified Contractor.

**PART 33 – TEMPORARY USE OF EQUIPMENT:**

- 33.1 The permanent heating and plumbing equipment, when installed, may be used for temporary services, with the consent of the Engineer. Use of the permanent equipment shall be dependent upon the cleanliness of the job site as determined by Owner, Architect and Engineer. Should the permanent systems be used for this purpose the Contractors shall make all temporary connections required at their expense. They shall also make any replacement required due to damage wear and tear, etc., leaving the same in "as new" condition.
- 33.2 Permission to use the permanent equipment does not relieve the Contractors from the responsibility for any damages to the building construction and/or equipment which might result because of its use.
- 33.3 Warranties shall begin at substantial completion regardless of temporary use of equipment or not.
- 33.4 A pre-start-up conference shall be held in accordance with EQUIPMENT/CONTROLS START-UP AND VERIFICATION in this section.
- 33.5 The VRF and outside air energy recovery units shall not be used for temporary heating and cooling.

- 33.6 For rooftop units during all phases of construction:
- At a minimum, four complete sets of filter media are required for each unit. In each unit, install two sets of filter media during construction (more shall be required if construction activities dictate more frequent changes). In each unit, install one set of filter media at substantial completion. Leave one set of filter media in boxes in appropriate mechanical room as a spare set for the Owner. All other filters shall be used by the Contractor during construction. Dispose of all construction filter media.
  - On the outside of all return air openings install a minimum of two sets of fiberglass filter media, such as cheesecloth, to be utilized as pre-filters for the “construction” filters. Install first set upon start-up and then install second set when first set is dirty. Dispose of all dirty construction filters. Change filters as often as necessary to keep units from becoming dirty at no additional cost.
  - At substantial completion of the project the entire unit shall be cleaned to present a like “new” unit for the Owner and all filters shall be replaced with new.

**PART 34 – NOISE, VIBRATION OR OSCILLATION:**

- 34.1 All work shall operate under all conditions of load without any sound or vibration which is objectionable in the opinion of the Engineer. In case of moving machinery, sound, or vibration noticeable outside of room in which it is installed, or annoyingly noticeable inside its own room, will be considered objectionable. Sound or vibration conditions considered objectionable by the Engineer shall be corrected in an approved manner by the Contractor at their expense.
- 34.2 All equipment subject to vibration and/or oscillation shall be mounted on vibration supports whether indicated or not suitable for the purpose of minimizing noise and vibration transmission and shall be isolated from external connections such as piping, ducts, etc. by means of flexible connectors, vibration absorbers, or other approved means.
- 34.3 Unitary equipment, such as room units, exhaust fans, etc., shall be rigidly braced and mounted to wall, floor or ceiling as required and tightly gasketed and sealed to mounting surface to prevent air leakage and to obtain quiet operation. Flush and surface mounted equipment such as diffusers, grilles, etc., shall be gasketed and affixed tightly to their mounting surface.
- 34.4 The Contractor shall provide supports for all equipment they furnish. Supports shall be liberally sized and adequate to carry the load of the equipment and the loads of attached equipment, piping, etc. All equipment shall be securely fastened to the structure either directly or indirectly through supporting members by means of bolts or equally effective means. If strength of supporting structural members is questionable, contact Engineer.

**PART 35 – EQUIPMENT/CONTROLS STARTUP & VERIFICATION:**

- 35.1 The Contractor and their Subcontractors shall include in the bid to provide equipment and controls startup and verification for ALL Mechanical Systems specified for this project.
- 35.2 A pre-start-up conference shall be held with the Architect, Engineer, Owner, General Contractor, Mechanical Contractor, Electrical Contractor, Controls Contractor, Test and Balance Contractor, and the Manufacturer’s providing startup services. The purpose of this meeting will be to discuss the goals, procedures, etc. for start-up.
- 35.3 Specific line-items shall be included on the schedule of values by each Trade for “equipment and controls startup”. These line-item values shall be approved by the Engineer. The Engineer, Owner and the Engineer’s Field Inspector(s) shall closely monitor progress and quality of the equipment and controls startup and may withhold pay requests as deemed appropriate until satisfactorily completed.

- 35.4 Specific startup/verification specifications are included throughout the Mechanical Specifications. In general, as part of the verification process, equipment suppliers shall perform start-up by their factory authorized technicians, not third party Contractors, and shall complete and submit start-up reports/checklists. The Contractor shall have appropriate trades on site to correct all deficiencies noted by the factory representative. For each deficiency noted, documentation of corrective action (including date and time) shall be submitted to the Engineer and Owner. Where factory start-up is not specified for a particular piece of equipment or system, the Contractor shall be responsible to perform start-up. All information shall be completed by the Contractor and submitted to the Owner/Engineer prior to acceptance of the equipment.
- 35.5 The Contractor shall be responsible for completion of System Verification Checklists/Manufacturer's Checklists. Factory startup is required for all HVAC equipment noted. Unless noted otherwise, as part of the verification process, equipment suppliers shall perform start-up by their factory authorized technicians and shall complete and submit start-up reports/checklists. This shall include the following:
- VRF systems
  - Energy recovery systems
- 35.6 Except for the specific equipment specified in this Specification Section, the manufacturer's recommended startup procedures and checklists will be acceptable for use in the project. Where "manufacturer" startup is not specified, then this Contractor shall perform startup services in strict accordance with manufacturer's instructions. All startup/verification process shall be thoroughly documented by the Contractor and shall include the time and date when performed.
- 35.7 The Contractor shall "zip-tie" a start-up report to each piece of equipment in a clear plastic cover. Once start-up completion is verified by the Engineer the Contractor shall remove all reports and consolidate them into close-out documentation. The Contractor shall be responsible for completion of System Verification Checklist (SVC) / Manufacturer's Checklists.

**PART 36 – INSPECTION, APPROVALS AND TESTS:**

- 36.1 Before requesting a final review of the installation from the Architect and/or Engineer, each Contractor shall thoroughly inspect their installations to assure that the work is complete in every detail and that all requirements of the Contract Documents have been fulfilled. Failure to accomplish this may result in charges from the Architect and/or Engineer for unnecessary and undue work on their part.
- 36.2 The Contractor shall provide as a part of this Contract any required Agency inspection, licensed and qualified to provide such services. All costs incidental to the provisions of inspections shall be borne by the Contractor.
- 36.3 The Contractor shall advise each Inspecting Agency in writing, with an informational copy of the correspondence to the Architect and/or Engineer, when they anticipate commencing the work. Inspections shall be scheduled for rough-in as well as finished work. The rough-in inspections shall be divided into as many inspections as may be necessary to cover all rough-in without fail. Failure of the Inspecting Agency to inspect the work in a timely manner and submit the related reports may result in the Contractor having to expose concealed work not so inspected. Such exposure will be at the expense of the responsible Contractor.
- 36.4 Approval by an Agency Inspector does not relieve the Contractor from the responsibilities of furnishing equipment having a quality of performance equivalent to the requirements set forth in these Plans and Specifications. All work under this contract is subject to the review of the Architect and/or Engineer, whose decision is binding.

- 36.5 Before final acceptance, the Contractor shall furnish the original and three (3) copies of the certificates of final approval by the Agency Inspector to the Engineer with one copy of each to the appropriate government agencies, as applicable. Final payment for the work shall be contingent upon completion of this requirement.

**PART 37 - ABOVE-CEILING AND FINAL PUNCH LISTS:**

- 37.1 The Contractor shall review each area and prepare and complete their own punch list for each of the subcontractors as required for the Project Schedule.
- 37.2 Seven (7) days notice shall be given to the Engineer for review of above ceiling work that will be concealed by tile or other materials. Seven (7) days notice shall be given to the Engineer for review of below ceiling work and final inspection.
- 37.3 When all work from the Contractor's punch list is complete at each of the major Project Stages and prior to completing ceiling installations (or at the final punch list stage), the Contractor shall request that the Engineer develop a punch list. This request is to be made in writing seven (7) days prior to the proposed date. After all corrections have been made from the Engineer's punch list, the Contractor shall review and initial off on each item. This signed-off punch list shall be submitted to the Engineer. The Engineer shall return to the site once to review each punch list and all work prior to the ceilings being installed and at the final punch list review. The Contractor's representative may be requested at the inspections.
- 37.4 If additional visits are required by the Engineer to review work not completed by this review, the Engineer shall be reimbursed directly by the Contractor by check or money order (due net 10 days from date of each additional visit) at a rate of \$125.00 per hour plus travel expense for extra trips required to complete either of the above ceiling, below ceiling or final punch lists.

**PART 38 – OPERATING INSTRUCTIONS:**

- 38.1 Upon completion of all work and all tests, each Contractor shall furnish the necessary skilled labor and helpers for operating the systems and equipment for a period of three (3) days of eight (8) hours each, or as otherwise specified. Refer to Section HVAC EQUIPMENT for additional requirements. During this period, instruct the Owner or their representatives fully in the operations, adjustment, and maintenance of all equipment furnished. Give at least seven (7) days written notice to the Owner, Architect and Engineer in advance of this training period. The Engineer may attend any such training sessions or operational demonstrations. The Contractor shall certify in writing to the Engineer that such demonstrations have taken place, noting the date, time and names of the Owner's representatives that were present.
- 38.2 Each Contractor shall furnish three complete bound sets for approval to the Engineer instructions for operating and maintaining all systems and equipment included in this contract. All instructions shall be submitted in draft form, for approval, prior to final issue. Manufacturer's advertising literature or catalogs will not be acceptable for operating and maintenance instructions. Refer to Specification Section SHOP DRAWINGS for additional detail.
- 38.3 Each Contractor, in the above mentioned instructions, shall include the maintenance schedule for the principal items of equipment furnished under this contract and a detailed, easy to read parts list and the name and address of the nearest source of supply.



**PART 39 – RECORD DRAWINGS:**

- 39.1 The Contractor shall ensure that any deviations from the Design are as they occur recorded in red, erasable pencil on record drawings kept at the jobsite. The Engineer shall review the record documents from time to time to ensure compliance with this specification. Compliance shall be a contingency of final payment. Pay particular attention to the location of under floor sanitary and water lines, shut-off valves, cleanouts, and other appurtenances important to the maintenance and operation of Mechanical Systems. Also, pay particular attention to Deviations in the Control Systems and all exterior utilities. Keep information in a set of drawings set aside at the job site especially for this purpose and deliver to the Engineer upon completion of the work.

**PART 40 - COMMISSIONING: CONTRACTOR RESPONSIBILITIES:**

- 40.1 Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:
- Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
  - Cooperate with the CxA for resolution of issues recorded in the Issues Log.
  - Attend commissioning team meetings.
  - Integrate and coordinate commissioning process activities with construction schedule.
  - Complete electronic construction checklists as Work is completed and provide to the Commissioning Authority.
  - Review and accept commissioning process test procedures provided by the Commissioning Authority.
  - Complete commissioning process test procedures.

**END OF GENERAL PROVISIONS - MECHANICAL**

## **SECTION 20 02 00 - SCOPE OF THE MECHANICAL WORK**

### **PART 1 – GENERAL:**

- 1.1 The Contractor's attention is directed to the General and Special Conditions, GENERAL PROVISIONS – MECHANICAL and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.
- 1.2 The Mechanical work for this Contract shall include all labor, materials, equipment, fixtures, excavation, backfill and related items required to completely install, test, place in service and deliver to the Owner the complete mechanical systems in accordance with the accompanying plans and all provisions of these specifications. This work shall primarily include but is not necessarily limited to the following paragraphs.
- 1.3 All applicable services and work specified in GENERAL PROVISIONS - MECHANICAL.
- 1.4 Installation of all equipment per the manufacturer's instruction, whether specifically detailed or not.
- 1.5 Provide all required motor starters, etc. not provided under the electrical sections.
- 1.6 Thorough instruction of the Owner's maintenance personnel in the operation and maintenance of all mechanical equipment.
- 1.7 Thorough coordination of the installation of all piping, ductwork, equipment, and any other material with other trades to ensure no conflict in installation.
- 1.8 Approved supervision of the mechanical work.
- 1.9 Procurement of all required inspections, including fees for all inspection services and submission of final certificates of inspection to the Engineers.
- 1.10 Excavation, backfilling, cutting, patching, sleeving, concrete work, etc., required to construct the mechanical systems.
- 1.11 Equipment and controls start-up, verification and documentation as specified.
- 1.12 Record drawings, final inspection certificates, test results, O & M documentation, warranty certification, spare parts, and other specified closeout documentation.
- 1.13 Required schedule of values breakdown.
- 1.14 Pipe, duct, and equipment identifications.
- 1.15 Preinstallation meetings and equipment mockups.
- 1.16 Specified Commissioning activities.
- 1.17 Complete heating, ventilation, and air conditioning systems.
- 1.18 Refrigerant piping systems including all verification of installation.

- 1.19 All mechanical exhaust systems.
- 1.20 All insulation associated with mechanical systems.
- 1.21 Instillation, handing, startup and initial servicing of owner provided equipment.
- 1.22 Condensate drainage systems.
- 1.23 All required pressure testing, flushing, purging, pressure, and flow testing requirements.
- 1.24 Final coordination and connection of all mechanical equipment furnished by others.
- 1.25 Complete natural gas and propane piping systems.
- 1.26 All required controls, including self checkout and commissioning.

**END OF THE SCOPE OF THE MECHANICAL WORK**

**SECTION 20 03 00 - SHOP DRAWINGS, MAINTENANCE MANUALS AND PARTS LISTS**

**PART 1 – GENERAL:**

- 1.1 The Contractor's attention is directed to the General and Special Conditions, GENERAL PROVISIONS – MECHANICAL and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.
- 1.2 The Contractor shall prepare and submit to the Engineer, through the Prime Contractor and the Architect within thirty (30) days after the date of the Contract, required copies of all shop drawings, certified equipment drawings, installation, operating and maintenance instructions, samples, wiring diagrams, etc. on all items of equipment specified hereinafter. Refer to Division 1 requirements for shop drawing submittal requirements.
- 1.3 Provide all shops in electronic/PDF format. The Engineer's comments will be returned in electronic format.
- 1.4 Each shop drawing and/or manufacturers descriptive literature shall have the proper notation indicated on it selecting equipment, accessories and features and shall be clearly referenced to the specifications, schedules, fixture numbers, etc., so that the Engineer may readily determine what the Contractor proposes to furnish. All data and information schedules indicated or specified shall be noted on each copy of each submittal.
- 1.5 Submittal data shall include specification data including metal gauges, finishes, accessories, etc. Also, the submittal data shall include certified performance data, wiring diagrams, dimensional data, and a spare parts list. Submittal data shall be reviewed by the Engineer before any equipment or materials is ordered or any work is begun in the area requiring the equipment.
- 1.6 All submittal data shall have the stamp of approval of the Contractor submitting the data as well as the Prime Contractor and the Architect to show that the drawings have been reviewed by the Contractor. Any drawings submitted without these stamps of approval may not be considered and will be returned for proper resubmission.
- 1.7 The Contractor shall make any corrections or changes required by the Engineer and shall re-submit for final review as outlined above.
- 1.8 It shall be noted that review of shop drawings by the Engineer applies only to conformance with the design concept of the project and general compliance with the information given in the Contract Documents. In all cases, the Contractor alone shall be responsible for furnishing the proper quantity of equipment and/or materials required, for seeing that all equipment fits the available space in a satisfactory manner and that piping, electrical and all other connections are suitably located. The Contractor shall also coordinate piping side connections.
- 1.9 The Engineer's review of shop drawings, schedules or other required submittal data shall not relieve the Contractor from responsibility for adaptability of the item to the project; compliance with applicable codes, rules, regulations, and information that pertains to fabrication and installation; dimensions. weight and quantities; electrical characteristics; and coordination of the work with all other trades involved in this project.

- 1.10 Prior to ordering any materials or rough-in of any kind, the Mechanical Contractor shall be responsible for final coordination of all electrical requirements (i.e. voltage, phase, circuit breaker, wire sizing, etc.) with the Electrical Contractor. There will be no change in the Contract Amount for any discrepancies. A final coordination meeting shall be held with the Architect, Owner, Engineer, Prime Contractor, Mechanical Contractor, Electrical Contractor, and their sub-contractors.
- 1.11 Equipment shall not be ordered and no final rough-in connections, etc., shall be accomplished until reviewed equipment shop drawings are in the hands of the Contractor. It shall be the Contractor's responsibility to obtain reviewed shop drawings and to make all connections, etc. in the neatest and most workmanlike manner possible. The Contractor shall coordinate with all the other trades having any connections, roughing-in, etc. to the equipment.
- 1.12 If the Contractor fails to comply with the requirements set forth above, the Engineer shall have the option of selecting any or all items listed in the Specifications or on the Drawings; and the Contractor shall be required to furnish all materials in accordance with this list.
- 1.13 Colors for equipment in other than mechanical spaces shall be selected from the Manufacturer's standard and factory optional colors unless noted otherwise on the Plans. Color samples shall be furnished with the shop drawing submission for such equipment.
- 1.14 All submittals for mechanical equipment shall include all information specified and scheduled. This shall include air and water pressure drops, RPM, noise data, face velocities, horsepower, voltage motor type, steel or aluminum construction, and all accessories clearly marked.
- 1.15 All items listed in the schedules shall be submitted for review in a tabular form similar to the equipment schedule. All items submitted shall be designated with the same identifying tag as specified on each sheet.
- 1.16 Any submittals received in an unorganized manner without options to be provided specifically noted and with incomplete data will be returned for resubmittal.

**PART 2 – SHOP DRAWINGS:**

- 2.1 Shop Drawings, descriptive literature, technical data and required schedules shall be submitted on the following:

Access Doors  
Firestopping  
VAV Boxes  
Ductwork Accessories/Volume Dampers  
System Verification Check Lists  
Temperature Controls & Components

(Refer to the corresponding Special Notes.)

- 2.2 SPECIAL NOTES:

- 2.2.1 For all items above, upon substantial completion of the project, the Contractor shall deliver to the Engineer (in addition to the required Shop Drawings) three (3) complete copies of operation and maintenance instructions and parts lists for each item above. Where available, documents shall include at least:
  - Detailed operating instructions

- Detailed maintenance instructions including preventive maintenance schedules.
- Addresses and phone numbers indicating where parts may be purchased.
- Expanded parts drawings, parts lists, service manuals, schematics, wiring diagrams.
- Master air filter list including equipment identification, filter size, filter quantity, and supplier contact information.
- Start-up reports, service records and test reports.

2.2.2 Shop drawings for the Temperature Control Systems shall include detailed, scaled plans and schematic diagrams indicating the function and operation of the system. Refer to Specification Section – CONTROLS for additional requirements.

2.2.3 The Contractor shall submit project specific UL listed firestopping installation drawings to the authority having jurisdiction where required for their approval as required.

**END OF SHOP DRAWINGS, ETC.**

## **SECTION 20 04 00 - DEMOLITION AND SALVAGE**

### **PART 1 – GENERAL:**

- 1.1 The Contractor's attention is directed to the General and Special Conditions, GENERAL PROVISIONS - MECHANICAL and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.
- 2.1 It is the intent of this Section to completely remove all components of any existing mechanical system indicated in the mechanical drawings and items associated with the required architectural demolition specified in the Contract Documents. Also, any mechanical systems that will be open to view, or will interfere with the operations of the completed building, or which will, in any way, interfere with project construction shall be removed. The Contractor shall field verify existing conditions prior to bid.

### **PART 3 – HVAC DEMOLITION:**

- 3.1 The general scope of the HVAC system demolition is indicated on the drawings. Where HVAC units are removed, also remove all associated ductwork, branch piping, hangers, insulation, concrete pads, controls, etc.
- 3.2 Refer to the demolition drawings for equipment, piping, and ductwork to be demolished or which shall remain. If other equipment, piping, or ductwork is found during construction which is not indicated on the drawings, it must be determined if these systems serve other areas not being renovated. If the equipment piping and ductwork serve only renovated areas, the system shall be demolished. Verify this work with the Engineer prior to demolition.
- 3.3 Remove all temperature controls, panels, accessories, etc. that are accessible or become accessible during construction that serves demolished systems. Remove all pneumatic control tubing, control wiring and conduits in the facility unless noted otherwise.
- 3.4 The Contractor shall be responsible for the removal and/or relocation of any HVAC piping, equipment, fittings, valves, etc. which may, in the course of construction, interfere with the installation of any new and/or relocated Architectural, Structural, Mechanical or Electrical Systems specified in the Contract Documents at no increase in the contract price.
- 3.5 Unless otherwise indicated, the Contractor shall be responsible for the patching and repairing by qualified tradesmen of all holes, etc. in the ceiling, wall, roof, and floors where HVAC equipment is removed.
- 3.6 Where piping and ductwork systems are partially demolished, cap systems air and watertight and insulate. All capping of duct systems shall be completed with 22 gauge sheet metal and insulated. Seal with duct sealant.

### **PART 4 – REFRIGERANT RECOVERY:**

- 4.1 The Contractor shall have a licensed refrigerant recovery technician evacuate all refrigerants from all refrigeration equipment being removed in accordance with EPA guidelines and regulations. The Contractor shall take all necessary precautions to not accidentally vent refrigerants to the atmosphere. The refrigerant shall become the property of the Contractor.

**PART 5 – SALVAGE:**

- 5.1 It is the intent of this section to deliver to the Owner all components which may be economically reused by them. The Contractor shall make every effort to remove reusable components without damage.
- 5.2 Components to be delivered to the Owner shall be specifically identified by the Owner's representative prior to beginning the demolition. The Contractor shall prepare a letter of transmittal of all salvaged items and obtain the Owner's signature and date of receipt.
- 5.3 Other items become the property of the Contractor and are to be removed from the site and disposed of properly.

**END OF DEMOLITION AND SALVAGE**



**SECTION 20 11 00 - SLEEVING, CUTTING, PATCHING, REPAIRING AND FIRESTOPPING**

**PART 1 – GENERAL:**

- 1.1 The Contractor's attention is directed to the General and Special Conditions, GENERAL PROVISIONS – MECHANICAL and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.
- 1.2 The Contractor shall be responsible for all openings, sleeves, trenches, etc., that may be required in floors, roofs, ceilings, walls, etc., and shall coordinate all such work with the General Contractor and all other trades. Coordinate with the General Contractor, any openings which they are to provide before submitting a bid proposal in order to avoid conflict and disagreement during construction. Improperly located openings shall be reworked at the expense of the Contractor.
- 1.3 The Contractor shall plan their work ahead and shall place sleeves, frames or forms through all walls, floors and ceilings during the initial construction, where it is necessary for piping, ductwork, conduit, etc., to route through; however, when this is not coordinated, the Contractor shall then do all cutting and patching required for the installation of their work, or pay other trades for doing this work when so directed by the Engineer. Any damage caused to the building by this Contractor shall be corrected or rectified at their expense.
- 1.4 The Contractor shall notify other trades in due time where they will require openings or chases in new concrete, masonry, etc. Set all concrete inserts and sleeves for their work. Failing to coordinate, Contractor shall cut openings for the work and patch same as required at their expense with qualified tradesman.
- 1.5 The Contractor shall be responsible for properly shoring, bracing, supporting, etc., any existing and/or new construction to guard against cracking, settling, collapsing, displacing, or weakening while openings are being made. Any damage occurring to the existing and/or new structures, due to failure to exercise proper precautions or due to action of the elements shall be promptly and properly corrected to the satisfaction of the Engineer.
- 1.6 All work improperly performed or not performed as required in this section, shall be corrected by the General Contractor at the responsible Contractor's expense.

**PART 2 – SLEEVES:**

- 2.1 Cast iron or Schedule 40 steel sleeves shall be installed through all walls where pipe enters the building below grade. Sleeves shall be flush with each face of the wall and shall be sufficiently larger than the entering pipe to permit thorough caulking between pipe and sleeve for water proofing. Horizontal sleeves passing through exterior walls or where there is a possibility of water leakage and damage shall be caulked watertight. Utilize "Link-Seal" at these locations.
- 2.2 In all cases, sleeves shall be at least two pipe sizes larger than nominal pipe diameter plus insulation. Sleeves through walls and floors shall be cut off flush with inside surface unless otherwise indicated.
- 2.3 Vertical sleeves in roofs shall be flashed and counterflashed with lead (4 lb.) or 16 oz. copper and welded or soldered to piping, lapped over sleeve and properly weather sealed. Where sleeves pass through roof construction, sleeves shall extend minimum of 12" above the roof.

- 2.4 Cast iron or Schedule 40 steel sleeves shall be installed through all walls where pipe enters the building below grade. Sleeves shall be flush with each face of the wall and shall be sufficiently larger than the entering pipe to permit thorough caulking between pipe and sleeve for water proofing. Horizontal sleeves passing through exterior walls or where there is a possibility of water leakage and damage shall be caulked watertight. Utilize "Link-Seal" at these locations.
- 2.5 Provide pipe sleeves through all interior wall penetrations. Sleeve shall be cast iron or schedule 40 steel. In all cases, sleeves shall be at least two pipe sizes larger than nominal pipe diameter plus insulation. Sleeves through walls and floors shall be cut off flush with inside surface unless otherwise indicated. Reference Part 5 for firestopping requirements in rated walls. Sleeves and annular space between pipe and sleeve in non-rated walls shall be sealed completely with acoustical non-shrink caulk.
- 2.6 Vertical sleeves in roofs shall be flashed and counterflashed with lead (4 lb.) or 16 oz. copper and welded or soldered to piping, lapped over sleeve and properly weather sealed. Where sleeves pass through roof construction, sleeves shall extend minimum of 12" above the roof.

### **PART 3 – CUTTING:**

- 3.1 All openings in plaster, gypsum board or similar materials, shall be framed by means of plaster frames, casing beads, or angle members as required. The intent of this requirement is to provide smooth, even termination of wall, floor, and ceiling finishes as well as to provide a fastening means for devices, etc.
- 3.2 The Mechanical Contractor shall coordinate all openings in masonry walls with the General Contractor; and, unless otherwise indicated in the Contract Documents, shall provide lintels for all openings required for the mechanical work such as louvers, exhaust fans, etc. Prime paint all lintels. Lintels shall be sized as follows: Unless noted otherwise in the Structural Drawings.
  - 3.2.1 New Openings under 48" in width: Provide one 3½"x3½"x3/8" steel angle for each 4" of masonry width. Lintel shall have 8" bearing on each end.
  - 3.2.2 New Openings over 48" in width: Consult with Structural Engineer.
- 3.3 No cutting shall be performed at location that will weaken the structure and unnecessary cutting must be avoided. If in doubt, contact the Engineer.
- 3.4 Pipe openings in slabs and walls shall be cut with core drill. Hammer devices will not be permitted. Edges of trenches and large openings shall be scribe-cut with a masonry saw.

### **PART 4 – PATCHING, REPAIRING AND FINISHING:**

- 4.1 Patching and repairing made necessary by work performed under this Division shall be included as a part of the work and shall be done by skilled workers of the trade. The work shall be performed in strict accordance with the provisions herein before specified to match adjacent surfaces and in a manner acceptable to the Engineer.
- 4.2 Where portions of existing sites, lawns, shrubs, paving, etc. are disturbed for installation of work of this Division, such items shall be repaired and/or replaced back to original or better condition to the satisfaction of the Engineer.
- 4.3 Piping and ductwork passing through floors, ceilings and walls in finished areas shall be fitted with chrome plated brass escutcheon trim pieces of sufficient outside diameter to amply cover the sleeved openings and an inside diameter to closely fit the pipe/duct around which it is installed.

- 4.4 Flanged metal collars shall be provided around all ducts, flues, pipes, etc. at all wall penetrations, both sides. Penetrations through any wall will require the installation of flanged collars. Openings shall not be any larger than 2" in any direction than the piping/duct passing through the wall. Openings larger than this requirement shall also be infilled to match adjacent construction. Fill void with insulation for sound reduction.

**PART 5 – FIRESTOPPING:**

- 5.1 Provide shop drawings indicating penetration detail for each type of wall and floor construction. Shop drawings must be specific for each individual type of penetration (one hour fire rated gypsum wall board with insulated metal pipe penetration, etc.) Provide copies to the authority having jurisdiction if required.
- 5.2 All mechanical pipes and ducts penetrating fire rated floors and walls shall be firestopped by this Contractor. All firestopping products and assemblies installed shall be UL listed.
- 5.3 Where the installation of conduit, ducts, piping, etc. requires the penetration of fire or smoke rated walls, ceilings or floors, the space around such conduit, duct, pipe, etc., shall be tightly filled with an approved non-combustible fire insulating material and properly sealed to maintain the rating integrity of the wall, floor or ceilings affected.
- 5.4 Where the installation of ductwork requires the penetration of non-rated floors, the space around the duct or pipe shall be tightly filled with an approved non-combustible material.
- 5.5 The manufacturer of the firestopping materials shall provide onsite training for the installing Contractor. The training session shall demonstrate to the Contractor the proper installation techniques for all the firestopping materials.
- 5.6 Firestopping materials include (but are not limited to) wraps, strips, caulks, moldable putties, restricting collars with steel hose clamps, damming materials, composite sheets, fire dam caulks, steel sleeves, etc.
- 5.7 The following indicates the 3M penetration details for uninsulated pipe penetration of various wall and floor construction types (the list is not inclusive):
- One, two or three hour fire rated concrete floor - 3M #5300-MPC8.
  - One, two or three hour fire rated solid or block concrete wall - 3M #5300-MPC16 or 3M #5300-MPC26.
  - One hour fire rated gypsum wallboard - 3M #5300-MPC7.
  - Two hour fire rated gypsum wallboard - 3M #5300-MPC7.
- 5.8 The following indicates the 3M penetration details for insulated pipe penetrations of various wall and floor construction types (the list is not inclusive):
- One, two and three hour fire rated concrete floor - 3M #5300-IMP2.
  - One, two and three hour concrete block wall - 3M #5300-IMP2.
  - One hour fire rated gypsum wallboard - 3M #5300-IMP4.
  - Two hour fire rated gypsum wallboard - 3M #IMP7.
- 5.9 HVAC ducts penetrating a one or two hour fire rated wall or floor shall be firestopped per 3M #5300-HVD1.

- 5.10 Multiple pipes penetrating fire rated floors and walls may be firestopped as a group. Submit details for specific applications if this method of firestopping is chosen.

**END OF SLEEVING, CUTTING, PATCHING, ETC.**

**SECTION 20 13 00 - PIPE, PIPE FITTINGS AND PIPE SUPPORT**

**PART 1 – GENERAL:**

- 1.1 The Contractor's attention is directed to the General and Special Conditions, GENERAL PROVISIONS - MECHANICAL and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.
- 1.2 Each Contractor's attention is also directed to Specification Section HANGERS, CLAMPS, ATTACHMENTS, ETC.
- 1.3 Unless otherwise indicated, all materials shall be new and of the best grade and quality for the type specified. Materials shall comply with the "Buy American Act".
- 1.4 Where piping is not indicated on the plans, but is obviously or apparently required, contact the Engineer prior to submission of the bid.
- 1.5 All piping shall be capped or plugged during erection as required to keep clean and debris and moisture free.
- 1.6 The piping indicated shall be installed complete and shall be of the size indicated. When a pipe size is not indicated, the Contractor shall request the pipe size from the Engineer. Where a section of piping is not indicated but is obviously required for completion of the system, the Contractor shall provide same at no additional cost to the project.
- 1.7 All piping shall be installed straight and true, parallel, or perpendicular to the building construction. Piping shall be installed so as to allow for expansion without damage to the building finishes, structure, pipe, equipment, etc., use offsets, U-bends or expansion joints as required. No mitered joints or field fabricated pipe bends shall be accepted. Pipe shall clear all windows, doors, louvers, and other building openings.
- 1.8 All pipes shall be supported in a neat and workmanlike manner and wherever possible, parallel runs of horizontal piping shall be grouped together on hangers. Vertical risers shall be supported at each floor line with approved steel pipe riser clamps. Spacing of pipe supports shall not exceed eight (8) foot intervals for pipes 3" and smaller and ten (10) foot intervals on all other piping. Small vertical pipes (1" and less) shall be bracketed to walls, structural members, etc. at four (4) foot intervals so as to prevent vibration or damage by occupants.
- 1.9 Insulated piping shall be supported on a rigid insulation block at each hanger so as to prevent crushing of insulation by hangers. Hangers shall pass completely around the insulation jacket and a steel protective saddle shall be applied to prevent compression of the insulation. Refer to Specification Section INSULATION - MECHANICAL.
- 1.10 The use of wire or perforated metal to support pipes will not be permitted. Hanging pipes from other pipes shall not be permitted.
- 1.11 In metal buildings or buildings with light gauge trusses, support piping with standard pipe hangers with C-clamp connection to main structural members (not perlins), use angle steel cross pieces between main structural members where required to provide rigid support.

- 1.12 Where piping rests directly on a hanger, clip, bracket or other means of support, the support element shall be of the same material as the pipe, (e.g., copper to copper, ferrous to ferrous, etc.) or shall be electrically isolated one from the other so as to prevent pipe damage by electrolysis. Pay particular attention and do not allow copper pipe to rest on ferrous structural members, equipment, etc. without electrolytic isolation. This includes temporary support required during Construction.
- 1.13 In general, piping shall be installed concealed except in mechanical rooms, etc. unless otherwise indicated, and shall be installed underground or beneath concrete slabs only where indicated. All lines at ceilings shall be held as high as possible and shall run so as to avoid conflicts with other trades, and to facilitate the Owner's use and maintenance. Location of pipe in interior partitions shall be carefully coordinated with whoever will construct the partitions after the piping is in place. Where exposed risers occur, they shall be kept as close to walls as possible.
- 1.14 Pipe shall be cut accurately to measurements established at the building by the Contractor and worked into place without springing or forcing. All pipes shall be reamed to full pipe diameter before joining and before assembling. All lengths of pipe shall be set vertically and tapped with a hammer to remove scale and dust and inspected to ensure that no foreign matter is lodged therein.
- 1.15 All hot and cold water piping shall be kept a sufficient distance apart so as to prevent heat transfer between them. Cold water piping shall also be kept apart from refrigerant hot gas lines.
- 1.16 Piping carrying water or other fluids subject to freezing shall not be installed in locations subject to freezing. If in doubt, consult Engineer.
- 1.17 Pay particular attention to conflict of piping with other work. Do not install until conflict is resolved. If in doubt, consult Engineer.
- 1.18 Piping materials in each system shall, to the extent practicable, be of the same material. Frequent changes of material (for example, from copper to steel) shall be avoided and in no case shall be accomplished without use of insulating unions and permission of the Engineers.
- 1.19 Dielectric couplings or through ways shall be provided at all connections of dissimilar materials.
- 1.20 Nipples shall be of the same material, composition, and weight classification as pipe with which installed.
- 1.21 Apply approved pipe dope for service intended to all male threaded joints. The dope shall be listed for intended use.
- 1.22 Eccentric reducers shall be used where required to permit proper drainage and venting of pipe lines; bushings shall not be permitted.
- 1.23 High points of closed loop chilled and hot water systems shall have manual air vents as required unless automatic air vents are specifically indicated. Pipe to suitable drainage point.
- 1.24 Installation of pipe shall be in such a manner as to provide complete drainage of the system, whether detailed or not on plans. Drain valves shall be provided at all drainage points on pipes. Drain valves shall be ½" size ball valves with ¾" hose thread end and vacuum breaker. Label each drain valve.

- 1.25 Where plastic piping penetrates a fire rated assembly, it shall be replaced with a threaded metal adapter and metal pipe or whatever means necessary to maintain the separation rating in accordance with local plumbing and fire codes.
- 1.26 Plastic piping or any material with a flame and smoke spread rating not approved for plenum use shall not be permitted in supply, return, relief, or exhaust plenums.
- 1.27 All increases in vent size at roof shall be by means of service weight cast iron increasers.
- 1.28 Non-metallic piping shall be installed in strict accordance with the manufacturer's instructions. If no such instructions are available, consult Engineer.
- 1.29 When running any type of pipe below a footing, perpendicular to the footing, the area underneath the footing and in the zone of influence shall be backfilled with concrete. The zone of influence is the area within a 45 degree angle projecting down from the top edge of footing on all sides of the footing.
- 1.30 When running any type of pipe below a footing, parallel to the footing, the area underneath the zone of influence shall be backfilled with 4" of crushed stone or sand bedding under the pipe. Each pipe section shall be anchored into unexcavated earth on both ends with deadman anchor system. The remainder of the trench in the zone of influence shall be backfilled with cementitious flowable fill. The zone of influence is the area within a 45 degree angle projecting down from the top edge of the footing on all sides of the footing.
- 1.31 Piping for all drainage systems shall be installed to permit flow, trapping, and venting in accord with current codes and best practice.
- 1.32 Install all gas piping per NFPA54. Union or valves shall not be installed in an air plenum. Piping below slab must be sleeved and vented. Piping installed in contained non-vented areas shall not have mechanical joints.
- 1.33 The entire domestic hot, cold, and recirculating hot water piping system shall be sterilized in strict accord with requirements of the Department of Health Codes, Rules, and Regulations for the State in which the work is being accomplished.
- 1.34 Site water piping utilized for domestic service shall be filled, cleaned, and disinfected. Disinfection shall utilize chlorine per the local water company standards or approved equal. Hyper-chlorinated water shall be discharged and diluted at the end of the pipeline into the sanitary sewers per local utility regulations.
- 1.35 The entire sanitary waste and vent piping system within the building shall be air-tight. If any sewer gases are present within the building, it shall be the Contractor's responsibility to locate and correct any leaks and retest as required. Any sewer odor issues that occur during the Warranty Period shall be corrected by the Contractor.
- 1.36 Refrigerant piping must be installed to meet the HVAC equipment manufacturer's requirements. A refrigerant piping schematic shall be obtained from the equipment manufacturer which indicates pipe sizes, valves, traps, sight glasses and other required refrigerant specialties. While installing or soldering refrigerant lines, the piping system must be continuously purged with nitrogen. After the piping system is installed, the refrigerant system must be evacuated to 25 microns for eight hours. Contact Engineer 36 hours prior to installation of refrigerant lines or evacuation of refrigerant system.

- 1.37 When connecting to an existing hydronic water system (chilled, hot, geothermal, etc.) or domestic water system, the Contractor shall include cost to drain the existing piping system and refill with water/closed loop chemicals to match existing fluid. If the building is occupied, and the drain down will affect services to these occupied areas, then the systems shall be drained and refilled over a weekend at a time acceptable to the Owner. Refer to Specification Section PIPE FILLING, CLEANING, FLUSHING, PURGING AND CHEMICAL TREATMENT.

**PART 2 – UNIONS, FLANGES AND WELDED TEES:**

- 2.1 Screwed unions, soldered unions or bolted flanges shall be provided as required to permit removal of equipment, valves, and piping accessories from the piping system. Keep adequate clearances for coil removal, rodding, tube replacement, motor lubrication, filter replacement, etc. Flanged joints shall be assembled with appropriate flanges, gaskets, and bolting. The clearance between flange faces shall be such that the connections can be gasketed and bolted tight without imposing undue strain on the piping system.
- 2.2 Dielectric insulating couplings or through ways shall be used wherever the adjoining materials being connected are of dissimilar metals such as connections between copper and steel pipe.
- 2.3 Tee connections for welded pipe shall be assembled with welding fittings. Where the size of the side outlet is such that a different connection technique than on the run is required, a weldolet, sockolet, or threadolet type fitting may be used for the branch in place of reducing tees only where the branch is 2/3 the run size or smaller. Weld-o-let and thread-o-let branch connections are acceptable.

**PART 3 – SPECIFICATIONS STANDARDS:**

- 3.1 All piping and material shall be new, comply with the “Buy American Act” and shall conform to the following minimum applicable standards:
- Steel pipe; Schedule 40; ASTM A-53.
  - Copper tube; Type K, L, M; ASTM B88-62; Type DWV ASTM B306-62.
  - Cast iron soil pipe; ASA A-40.1 and CS 188-59.
  - Cast iron drainage fittings; ASA B16.12.
  - Cast iron screwed fittings; ASA B16.4.
  - Welding fittings; ASA B16.9.
  - Cast brass and wrought copper fittings; ASA B16.18.
  - Cast brass drainage fittings; ASA B16.23.
  - PVC pipe; Schedule 40; ASTM D-1785.
  - PVC pipe; Schedule 40; ASTM D2665 and D1784. Piping must be installed in compliance to the manufacturer’s recommendations which shall be made available to the plumbing inspector.

**PART 4 – PIPE TESTING AND CLEANING:**

- 4.1 Piping shall be tested before being insulated or concealed in any manner. Where leaks or defects develop, required corrections shall be made and tests repeated until systems are proven satisfactory.
- 4.2 Water piping systems shall be subjected to a hydrostatic test of 150 psi. The system shall be proven tight after a twenty-four (24) hour test.



- 4.3 The house drain line, interior storm sewers, interior rain water conductors, and all soil, waste and vent piping shall be subjected to a hydrostatic test of not less than a 10-foot head or an air test of not less than 5 psi and shall hold for 15 minutes.
- 4.4 Exterior sewer lines to the termination point outside the building shall be subject to a ten-foot hydrostatic test or an approved smoke test. These lines shall be subjected to a second test after 2 feet of backfill has been properly installed.
- 4.5 After fixtures have been installed, the entire plumbing system, exclusive of the house sewer, shall be subjected to an air pressure test equivalent to one inch water column and proven tight. The Contractor responsible shall furnish and install all of the test tees required, including those for isolating any portion of the system for tests.
- 4.6 The Contractor shall perform all additional tests that may be required by the Department of Health or other governing agency.
- 4.7 Any leaks or imperfections found shall be corrected and a new test run until satisfactory results are obtained. The cost of repair or restoration of surfaces damaged by leaks in any system shall be borne by the Contractor.
- 4.8 The natural gas service shall be tested in accordance with requirements and/or recommendations of the local gas company.
- 4.9 Natural gas piping downstream of the meter assembly shall be tested per the local gas company requirements or the following (whichever is stricter):
- Low Pressure (up to 14" wc) – Test to 10 psi for 24 hours.
  - Elevated Pressure (up to 2 psi) – Test to 50 psi for 24 hours.
  - Medium pressure (up to 60 psi) – Test to 100 psi for 24 hours.
- 4.10 Contractor shall notify TAB Agency in writing that the domestic water system has been flushed, cleaned and ready for sterilization or sanitizing. No chemicals are to be added to this system until all balancing has been completed for risk of contamination. The TAB firm is to properly notify all parties in writing when they have completed this portion of testing. If not properly coordinated, then the system will require additional sterilization and sanitizing at the Contractor's expense. Refer to TESTING, BALANCING, LUBRICATION AND ADJUSTMENTS Specification Section.

**PART 5 – PITCH OF PIPING:**

- 5.1 All piping systems shall be installed so as to drain to a low point. Certain minimum pitches shall be required for this drainage. For proper flow and/or for proper operation, the following pitches shall be required:
- 5.2 INTERIOR SOIL, WASTE AND VENT PIPING: ¼" per foot in direction of flow where possible but in no case less than 1/8" per foot.
- 5.3 SITE SANITARY LINES: Not less than one (1) % fall in direction of flow and no greater than indicated.
- 5.4 SITE STORM LINES: Not less than one (1) % grade in direction of flow.
- 5.5 ROOF LEADERS: 1/8" per foot where possible.
- 5.6 CONDENSATE DRAIN LINES FROM COOLING EQUIPMENT: Not less than ¼" per foot in direction of flow.

- 5.7 ALL OTHER LINES: Provide ample pitch to a low point to allow 100 percent drainage of the system.

**PART 7 – PLUMBING PIPING APPLICATIONS:**

7.1 NATURAL GAS PIPING – INTERIOR:

- 7.1.1 Schedule 40 black steel pipe with malleable iron threaded fittings for pipe sizes 2" and smaller.
- 7.1.2 Schedule 40 black steel pipe with wrought steel butt welded fittings for pipe sizes 2½" and larger.
- 7.1.3 Where gas pressure is 2 psi or greater, piping shall be schedule 40 black steel pipe with wrought steel butt welded fittings.
- 7.1.4 Paint all exterior piping as specified in Section IDENTIFICATIONS, TAGS, CHARTS, ETC.

**PART 8 – HVAC PIPING APPLICATIONS**

- 8.1 CONDENSATE DRAIN LINES: Type "M" copper tubing with sweat fittings and 95/5 solder.
- 8.2 REFRIGERANT PIPING: Type "L" copper tubing with forged or wrought copper fittings and silver soldered joints. Solder must have a minimum of 15% silver content.

**END OF PIPE, PIPE FITTING AND PIPE SUPPORT**

**SECTION 20 21 00 - VALVES**

**PART 1 – GENERAL:**

- 1.1 The Contractor's attention is directed to the General and Special Conditions, GENERAL PROVISIONS - MECHANICAL and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.
- 1.2 Each Contractor shall provide all valves required to control, maintain, and direct flow of all fluid systems indicated or specified. This shall include but may not be limited to all valves of all types including balancing valves, air vents, drain valves, check valves, special valves for special systems, etc., for all Mechanical Systems.
- 1.3 ACCEPTABLE MANUFACTURERS: Lunkenheimer, Powell, Nibco, Crane, Jenkins, T & S Brass, Walworth, Milwaukee, DeZurik, Consolidated Valve Industries, Inc., Bell & Gossett, Apollo.
- 1.4 The following type valves shall not be acceptable: Zinc, plastic, fiber or non-metallic.
- 1.5 Each type of valve shall be of one manufacturer, i.e., ball valves, one manufacturer, butterfly valves, one manufacturer, check valves, one manufacturer, etc.
- 1.6 All valves shall comply with current Federal, State and Local Codes. All valves shall be new and of first quality. All valves shall be designed and rated for the service to which they are applied. Zinc, plastic, fiber, or non-metallic valves shall not be acceptable.
- 1.7 Contractor shall provide colored tape on ceiling tile where valves are located above ceiling. Provide access panels where valves are located above hard ceiling.

**PART 2 – NATURAL & PROPANE GAS APPLICATIONS:**

- 2.1 GAS BALL VALVE (2" AND LESS): Nibco TFP600N gas ball valve. Valve shall forge two-piece brass, CSA/CGA CR 91-002 certified, 5 psig rating, lever handle, full port ball valve, lubricated shaft, PTFE seats, blowout proof stem and threaded ends.
- 2.2 GAS LUBRICATED PLUG VALVE, (2½" AND GREATER): Homestead lubricated industrial plug valve, Model 611/612, 100% round port, leak-proof, spring loaded ball and lubricant sealed check valve. Provide with threaded ends and lever handle.

**END OF VALVES**

**SECTION 20 22 00 - INSULATION - MECHANICAL**

**PART 1 – GENERAL:**

- 1.1 The Contractor's attention is directed to the General and Special Conditions, GENERAL PROVISIONS - MECHANICAL and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.
- 1.2 Work under this section shall include all labor, equipment, accessories, materials, and services required to furnish and install all insulation, fittings and finishes for all mechanical systems specified herein and/or as indicated.
- 1.3 Application of insulation materials shall be performed in accordance with manufacturer's written recommendations. Where thickness of insulation is not specified, use applicable thickness recommended by manufacturer for specific use.
- 1.4 Insulation thicknesses shall comply with the latest version of ASHRAE 90.1 and IECC at a minimum.
- 1.5 All insulation materials shall be installed per the latest edition of the National Commercial and Industrial Insulation Standards.
- 1.6 Insulation shall be installed by a company regularly engaged in the application of insulation and any work deemed unacceptable by the Engineer shall be removed and properly installed at the expense of the Contractor.
- 1.7 The Contractor shall photograph any installations prior to concealment. This includes duct risers in chases and at rooftop equipment.

**PART 2 – ACCEPTABLE MANUFACTURERS:**

- 2.1 Johns Manville, Knauf, Owens-Corning.

**PART 3 – FIRE RATINGS AND STANDARDS:**

- 3.1 Insulations, jackets, facings, adhesives, mastics, tapes, fitting materials, etc. shall have composite fire and smoke hazard ratings as tested by ASTM E-84, NFPA 255 and UL 723 procedures not exceeding Flame Spread 25, Smoke Developed 50 and Fuel Contributed 50.
- 3.2 All products and their packaging shall bear a label indicating above requirements are not exceeded.
- 3.3 Fiber glass duct wrap shall meet the requirements of Scientific Certification Systems Certification or Greenguard Validation of Formaldehyde Free.
- 3.4 Fiber glass mechanical board shall meet the requirement of the Greenguard Standards for Low-Emitting Products.
- 3.5 Fiber glass pipe insulation shall meet the requirement of the Greenguard Gold level standard.

**PART 4 – GENERAL APPLICATION REQUIREMENTS:**

- 4.1 "Concealed", where used herein, shall mean hidden from sight as in trenches, chases, furred spaces, pipe shafts, or above hung finished ceilings. "Exposed" shall mean that piping or equipment is not "concealed" as defined above. Piping and equipment in service tunnels, mechanical equipment rooms, storage areas, or unfinished rooms is to be considered "exposed".
- 4.2 Insulation shall be applied on clean, dry surfaces in a neat and workmanlike manner reflecting the best current practices in the trade. Insulation shall not be applied to piping, ductwork or equipment until tested, inspected and released for insulation.
- 4.3 Where more than one thickness of insulation is required, joints (both longitudinal and transverse) shall be staggered.
- 4.4 All insulation shall be continuous through walls, ceiling openings and sleeves. However, insulation shall be broken through fire walls. All covered pipe and ductwork is to be located a sufficient distance from walls, other pipe, ductwork and other obstacles to permit the application of the full thickness of insulation specified. If necessary, extra fittings and pipe are to be used. No noticeable deformation of insulation or discontinuity of vapor seal, where required, will be accepted. Coordinate work with plumbers, pipe fitters, etc. to assure hanger locations agree with location of insulation inserts.
- 4.5 Existing and/or new insulation removed and/or damaged during course of construction shall be repaired or replaced by the Contractor at their expense.
- 4.6 Vapor barrier jackets shall be applied with a continuous unbroken vapor seal. Do not use staples through the jacket. NO EXCEPTIONS!
- 4.7 All insulation shall be installed with joints butted firmly together.
- 4.8 The Contractor shall ensure that all insulation (piping, ductwork, equipment, etc.) is completely continuous along all conduits, equipment, connection routes, etc. carrying cold fluids (air, water, other) and that condensation can, in no way, collect in or on the insulation, equipment, conduits, etc. Any such occurrence of condensation collection and/or damage therefrom shall be repaired solely at the expense of the Contractor.
- 4.9 Unless otherwise specified or allowed, closed cell type insulation shall not be acceptable.
- 4.10 Piping and ductwork supports, including hangers, straps, uni-strut and all-thread rods, for insulated piping and ductwork shall be insulated and vapor sealed a minimum of 18" minimum beyond the piping and ductwork to prevent condensing. Coordinate with Sheetmetal Contractor.

**PART 5 – PIPING SYSTEMS:**

- 5.1 Seal insulation and jacket at all points where insulation terminates at unions, flanges, valves, and equipment. This applies to hot water lines only as cold water lines require continuous insulation and vapor barrier.
- 5.2 Pipe insulation shall extend around valve bodies to above drain pans in hydronic equipment over pumps, etc. to ensure no condensation drip or collection.
- 5.3 Valves, flanges, and unions shall only be insulated when installed on cold fluid piping whose surface temperature will be at or below the dew point temperature of the ambient air.

5.4 Insulation shall not extend through fire and smoke walls. Pack sleeve at fire and smoke wall with approved fire retardant packing similar to mineral wool and seal with approved sealant.

5.5 Metal insulation shields and inserts are required at all pipe hangers where the piping is insulated. Metal shields shall be constructed of galvanized steel, formed to a 180 degree arc. Insulation shields shall be the following size:

Pipe Size	Shield Gauge	Shield Length
2" and less	20	12"
2 1/2"- 4"	18	12"
5"- 10"	16	18"
Over 10"	14	24"

5.6 Insulated pipes 2" in diameter and larger shall be additionally supported with wood inserts of sufficient compressive strength to carry the weight of the pipe and fluid. Inserts shall extend beyond extend beyond the hanger and shall be at least 6" in length.

5.7 Provide premolded PVC insulated fitting covers on all pipe fittings, flanges, valves, and pipe terminations. Fittings shall be insulated by applying the proper factory precut insulation insert to the pipe fitting. The ends of the insulation insert shall be tucked snugly into the throat of the fitting and the edges adjacent to the pipe insulation tufted and tucked in, fully insulating the pipe fitting. The proper thickness of insulation must be applied to keep the jacket temperature less than 150°F. An approved vapor retarder mastic compatible with the PVC shall be applied around the edges of the adjoining pipe insulation and on the fitting cover throat overlap seam. The PVC fitting cover shall then be applied and secured with pressure sensitive tape along the circumferential edges. The tape shall extend over the adjacent pipe insulation and have an overlap on itself at least 2" on the downward side. On fittings where the operating temperature is below 50°F, two or more layers of the insulation inserts shall be applied with the first layer being secured with a few wrappings of fiber glass yarn to eliminate voids. One additional insert shall be used for each additional 1" of pipe insulation above 1-1/2". All joints shall be fully sealed.

5.8 PIPE INSULATION MATERIAL: Insulation shall be Knauf "Earthwool 1000° Pipe Insulation ASJ+SSL+" or approved equivalent fiberglass pipe insulation with an all service jacket. The insulation shall be a heavy density, pipe insulation with a K factor not exceeding 0.27 Btu per inch/h.ft² °F at 75°F mean temperature. The insulation shall be wrapped with a vapor barrier jacket. The jacket shall have an inside foil surface with self sealing lap and a water vapor permeability of 0.02 perm/inch. All circumferential joints shall be vapor sealed with butt strips. All insulation shall be installed in strict accordance with the manufacturer's recommendations. The following pipes shall be insulated with the minimum thickness of insulation as noted.

- 5.8.1 Refrigerant Liquid Lines (VRF Systems Only):
- Piping 1-1/4" and less: 1/2" thick insulation
  - Piping 1-1/2" and greater: 1" thick insulation
  - All exterior piping: 1-1/2" thick with jacketing

- 5.8.2 Refrigerant Hot Gas Lines (VRF Systems Only):
- Piping 1-1/4" and less: 1/2" thick insulation
  - Piping 1-1/2" and greater: 1" thick insulation
  - All exterior piping: 1-1/2" thick with jacketing

5.8.3 Condensate Drain Lines: 1/2" thick.

- 5.9 EXPOSED, EXTERIOR PIPING JACKETS: In addition to the insulation specified for the exterior pipe, provide 3M Venture Clad 1577CW. The jackets shall be installed as recommended by the manufacturer to maintain water tight seal on all exposed piping including elbows. All longitudinal and transverse seams to be sealed water tight.

**PART 6 – DUCTWORK SYSTEMS:**

- 6.1 Duct sizes indicated are the net free area inside clear dimensions; where ducts are internally lined, overall dimensions shall be increased accordingly.
- 6.2 Duct insulation shall extend completely to all registers, grilles, diffusers, and louver outlets, etc., to ensure no condensation drip or collection.
- 6.3 EXTERNAL INSULATION FOR SUPPLY, OUTSIDE AIR DUCTWORK: Knauf "Friendly Feel" faced, Duct Wrap, 0.75 PCF density, 2.2" thick or approved equivalent. Wrap shall be factory laminated to a reinforced foil kraft vapor barrier facing (FRK) with a 2" stapling flange at one edge. The installed R value shall be a minimum of 6.0. Flame spread 25, smoke developed 50, vapor barrier performance 0.02 perms per inch.

**END OF INSULATION - MECHANICAL**

**SECTION 20 24 00 - IDENTIFICATIONS, TAGS, CHARTS, ETC.**

**PART 1 – GENERAL:**

- 1.1 The Contractor's attention is directed to the General and Special Conditions, GENERAL PROVISIONS - MECHANICAL and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.

**PART 2 – TAGS AND CHARTS:**

- 2.1 Provide and install on each valve 1" in size or greater for all mechanical systems a 1.5" diameter circular bronze or baked phenolic tag fitted to each valve so that it cannot be removed. Each tag shall be embossed consecutively with sequential number identifiers. Number identifiers shall be determined by the Contractor sequentially.
- 2.2 Provide typewritten valve charts indicating each valve identifier, the valves service, normal position, and its location. Also furnish one electronic copy on CD in "\*.xls" format. One (1) copy of this chart shall be mounted in suitable frame(s) with clear plastic covers in a conspicuous location in each of the major mechanical rooms. Repeat only main valves which are to be operated in conjunction with operations of more than single mechanical room.
- 2.3 All emergency shutoff valves shall be identified with a permanent engraved tag hung from the valve with 1-inch high lettering. Emergency shutoff valves shall be identified as any valve whose closure could create an emergency condition in the facility (i.e. natural gas, water, domestic hot water, main HVAC valves, etc.).
- 2.4 Label all control panels and disconnect switches with service and equipment served.

**PART 3 – PIPING AND DUCTWORK IDENTIFICATION:**

- 3.1 All piping and ductwork installed shall be identified according to the charts hereinafter specified. Provide stenciled markers and arrows indicating direction of flow on all piping and ductwork installed under this contract. Markers and arrows shall be painted on the piping and ductwork using machine cut stencils. All letters shall be sprayed using fast drying lacquer paint. All markers and arrows shall be properly oriented so that descriptive name may be easily read from the floor. Piping and ductwork shall be identified on twelve (12) foot centers. All piping and ductwork shall be minimally identified once above all room ceilings and where it passes thru walls or floors. At the Contractor's option, Setmark or equivalent manufactured marking system may be substituted for field marking.
- 3.2 The following table describes the size of the color field and size of the identification letters which shall be used for pipes of different outside pipe diameters.

Outside Diameter	Label Length	Letter Size
3/4" – 1 1/4"	8"	1/2"
1 1/2" – 2"	8"	3/4"
2 1/2" – 6"	12"	1 1/4"
8" – 10"	24"	2 1/2"
Over 10"	24"	3 1/2"



3.3 The following chart describes the pipe service and label identification which shall be used for various pipes.

PIPE	ABBREVIATION
Refrigerant Piping	RFG - SUCTION or LIQUID
Natural Gas	NG`

**PART 4 – NATURAL GAS PIPING IDENTIFICATION:**

4.1 All natural gas piping within mechanical rooms shall be painted safety orange. Valves shall be painted red. Piping shall be prepped as required and piping shall be painted with at least two coats of paint or more if required to properly cover the piping. Piping in the kitchen shall be painted black. Exterior gas piping shall be painted to match the building with color as directed by the Architect/Owner.

**PART 5 – EQUIPMENT IDENTIFICATION:**

5.1 Unless otherwise specified, all equipment shall be identified. The titles shall be short and concise, and abbreviations may be used as long as the meaning is clear. In finished rooms and mechanical rooms, equipment shall be identified neatly and conspicuously with engraved black lamacoid plates (or equivalent) with 1" high white letters on the front of each piece of equipment.

5.2 All mechanical equipment and associated starters/disconnects shall have the electrical panel number and circuit number identified on a lamacoid plate. Coordinate with the Electrical Contractor.

**PART 6 – DUCTWORK IDENTIFICATION:**

6.1 All ductwork shall be identified as to the service of the duct and direction of flow. Include equipment designator on SA & RA ductwork. The letters shall be at least two inches high and the flow arrow shall be at least six inches long. The letters and flow arrow shall be made by precut stencils and black oil base paint with aerosol can. Concealed ducts also need to be identified.

DUCTWORK	ABBREVIATION
Supply Air Ductwork	SA + Equipment Identifier
Return Air Ductwork	RA + Equipment Identifier
Exhaust Air Ductwork	EA + Equipment Identifier
Outside Air Ductwork	OA + Equipment Identifier

**PART 7 – ACCESS THROUGH LAY-IN CEILINGS:**

7.1 Mark each lay-in ceiling panel which is nearest access to equipment, valves, dampers, filters, duct heaters, etc., with colored tape labels located on the ceiling grid.

**END OF IDENTIFICATIONS, TAGS, CHARTS, ETC.**

**SECTION 20 25 00 - HANGERS, CLAMPS, ATTACHMENTS, ETC.**

**PART 1 – GENERAL:**

- 1.1 The Contractor's attention is directed to the General and Special Conditions, GENERAL PROVISIONS - MECHANICAL and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.
- 1.2 Each Contractor's attention is also directed to Specification Section PIPE, PIPE FITTINGS AND SUPPORT.
- 1.3 This section includes, but is not limited to, furnishing, and installing supports, anchors, and accessories for piping, ductwork, equipment, etc. Furnishing and installing shall be by each trade for the completion of their work as directed in this Section.

**PART 2 – MATERIALS AND EQUIPMENT:**

- 2.1 HANGERS, CLAMPS, ATTACHMENTS SCHEDULE:
- ACCEPTABLE MANUFACTURERS: Grinnell, Elcen, Fee & Mason.
  - All hangers, clamps and attachments shall be manufactured products.
  - Pipe Rings (2" pipe and smaller) – adjustable swivel split ring or split pipe ring.
  - Pipe Clevis (2.5" pipe and larger) – adjustable wrought clevis type.
  - Pipe Clevis (All pipe sizes) – steel clevis for insulated pipe.
  - Riser Clamps (All pipe sizes) – extension pipe or riser clamp.
  - Beam Clamps (All pipe sizes) – malleable beam clamp with extension piece.
  - Brackets (All pipe sizes) – medium weight steel brackets.
  - Concrete Inserts (All pipe sizes) – wrought or wedge type inserts.
  - Concrete Fasteners (All pipe sizes) – self-drilling concrete inserts.
  - Rod Attachments (All pipe sizes) – extension pipe, rod coupling, forged steel turnbuckle
  - U-bolts (All pipe sizes) – standard u-bolt.
  - Welded Pipe Saddles (All pipe sizes) – pipe covering protection saddle sized for thickness of insulation.
  - Pipe Roll (All pipe sizes) – adjustable swivel pipe roll.
  - Protection Saddle (All pipe sizes) – 180 degree coverage, sheet metal pipe protection saddle.
  - Hanger Rods (All pipe sizes) – Steel, diameter of hanger threading.
  - Concrete Channel Inserts (All pipe sizes) – continuous heavy duty slot inserts unistrut.
  - Adjustable Spot Inserts (All pipe sizes) – continuous heavy duty spot insert unistrut.
  - Miscellaneous steel such as steel angles, rods, bars, channels, etc used in framing for supports, fabricated brackets, anchors, etc. shall confirm to ASTM-A-7.
- 2.2 HANGER RODS
- 2.2.1 Hanger rods or single rod hangers shall conform to the following:

PIPE SIZE	HANGER ROD DIAMETER STEEL PIPE	HANGER ROD DIAMETER COPPER, PLASTIC, HDPE
2" and smaller	3/8"	3/8"
2-1/2" through 3-5/8"	1/2"	1/2"
4" and 5"	5/8"	1/2"
6"	3/4"	5/8"

8" through 12"	7/8"	3/4"
14"	1'	7/8"

- 2.3 Rods for double rod hangers may be reduced on size. Minimum rod diameter is 3/8 inches.
- 2.4 Hanger rods and accessories used in mechanical spaces or otherwise dry areas shall have ASTM B633 electro-plated zinc finish.

**PART 3 – INSTALLATION:**

- 3.1 Supporting and hanging shall be done so that excessive load will not be placed on any one hanger so as to allow for proper pitch and expansion of piping.
- 3.2 Hangers and supports shall be placed as near as possible to joints, turns, and branches.
- 3.3 For concrete construction, utilize adjustable concrete inserts for fasteners. Expansion anchors and power driven devices may be used when approved in writing by the Architect/Engineer.
- 3.4 Utilize beam clamps for fastening to steel joists and beams. Expansion anchors in masonry construction. Do not support piping or ductwork from bridging or metal decking.
- 3.5 When piping is routed in joists, piping shall be top mounted on trapeze type hangers with each pipe individually clamped to trapeze hanger. Do not support piping or ductwork from bridging angles.
- 3.6 Trapeze hangers are not allowed, unless specifically approved by the Engineer.
- 3.7 Install all miscellaneous steel other than designed building structural members as required to provide means of securing hangers, supports, etc., where piping does not pass directly below or cross structural elements.
- 3.8 Piping shall not be supported by the equipment to which it is connected. Support all piping so as to remove any load or stress from the equipment.
- 3.9 Where piping, etc., is routed vertically, approved riser clamps, brackets or other means shall be utilized at approximately 10'-0" center to center minimum. An approved adjustable base stand or fitting on concrete support base shall be utilized at the base of the vertical run.
- 3.10 Where piping is routed along walls, knee braced angle frames, etc. pipe brackets with saddles, clamps, and rollers mounted on structural brackets fastened to walls or columns shall be used.
- 3.11 Support all ceiling hung equipment with approved vibration isolators.
- 3.12 Where copper tubing is specified, hangers shall be of copper clad type when piping is uninsulated.
- 3.13 Uninsulated piping hung from above shall be supported with ring and clevis type pipe hangers. Uninsulated piping mounted on trapeze (when allowed) and wall bracket type support shall be held in place with U-bolts. U-bolts shall allow for axial movement in the piping.
- 3.14 All insulated piping shall be supported with clevis type and pipe roll hangers. Hangers shall be sized to allow the pipe insulation to pass through the hangers. Install insulation protection saddles at all hanger locations. Welded pipe saddles shall be installed at all hangers on piping 5" and larger. The pipe saddles shall be sized for the thickness of insulation used. Hangers shall fit snugly around outside of insulation saddles.

- 3.15 Under no conditions will perforated band iron or steel wire driven hangers be permitted.
- 3.16 Support steel and copper piping at a minimum of eight (8) foot intervals for piping 3" and smaller and ten (10) foot intervals for larger piping. Provide additional support at end of the branches and change of direction.
- 3.17 Support plastic pipe at intervals not to exceed four (4) feet and at the end of the branches and at the change of direction and shall be installed as to permit freedom of movement. Vertical piping shall be supported at their bases and all upward movement shall not be restricted. Hangers shall be at least one (1) inch wide and shall not compress, distort, cut or abrade the piping to allow free movement at all times.
- 3.18 Where fireproofing is dislodged/damaged from the building structure due to Contractor's installation of hangers, clamps, etc., it shall be the Contractor's responsibility to repair all dislodged/damaged fireproofing to original fireproofing rating. This shall also include all work performed by their Contractors sub-contractors.
- 3.19 Ensure that all bolts and nuts are tightened.

**END OF HANGERS, CLAMPS, ATTACHMENTS, ETC.**

**SECTION 20 31 00 - TESTING, BALANCING, LUBRICATION AND ADJUSTMENTS**

**PART 1 – GENERAL:**

- 1.1 The Contractor's attention is directed to the General and Special Conditions, GENERAL PROVISIONS - MECHANICAL and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.
- 1.2 The Engineer, or authorized representative, shall be notified by the Contractor twenty-four (24) hours in advance of any tests called for in these Specifications or required by others.
- 1.3 Only after written approval, signed by the Engineer, shall the Contractor apply insulation or paint or allow the work to be furred in. This written approval, however, does not relieve the Contractor of the responsibilities for any failure during the guarantee period. The expense of all tests shall be borne by the Contractor, along with all temporary equipment, materials, gauges, etc. required for tests.
- 1.4 Contractor shall notify TAB Agency in writing that the domestic water system has been flushed, cleaned and ready for sterilization or sanitizing. No chemicals are to be added to this system until all balancing has been completed risk of contamination. The TAB firm is to properly notify all parties in writing when they have completed this portion of testing. If not properly coordinated, then the system will require additional sterilization and sanitizing at the Contractor's expense. Refer to PIPE, PIPE FITTINGS AND PIPE SUPPORT Specification Section.

**PART 2 - HEATING, VENTILATING AND AIR CONDITIONING TESTING:**

- 2.1 The test and balance of this system shall be by a Contractor who employs only the services of a certified AABC or independent NEBB firm whose sole business is to perform test and balance services.
- 2.2 The test and balance contractor shall bid directly to the Mechanical Contractor or Construction Manager or Owner.
- 2.3 Mechanical Contractor shall provide all start-up documents to Test and Balance Contractor prior to any test and balance services.
- 2.4 The Mechanical Contractor shall test all piping before being insulated or concealed in any manner. Where leaks or defects develop, required corrections shall be made and tests repeated until systems are proven satisfactory. Water piping systems shall be subjected to a hydrostatic test as specified and shall be proven tight after a twenty-four (24) hour test.
- 2.5 All motors, bearings, etc. shall be checked and lubricated as required during start-up procedures. All automatic, pressure regulating, and control valves shall be adjusted. Excessive noise or vibration shall be eliminated.
- 2.6 System balancing, where required, shall be performed only by persons skilled in this work. The system shall be balanced as often as necessary to obtain desired system operation and results.
- 2.7 All fan belts shall be adjusted for proper operation of fans.
- 2.8 Testing shall occur after completion of the ceiling systems installation.

- 2.9 All deficiencies observed by the Test and Balance Contractor shall be reported immediately to the Engineer and Mechanical Contractor.
- 2.10 Refer to Specification Section – CONTROLS – DIRECT DIGITAL for additional requirements.
- 2.11 Refer to Specification Section – GENERAL PROVISIONS – MECHANICAL for startup requirements.
- 2.12 PRIOR TO DEMOLITION: Provide pre-construction test services information for all existing outside air supply grills and provide to the engineer. Provide traverses at each outside and exhaust air drop including airflow and static pressure.
- 2.13 Provide a preliminary test report to the Engineer immediately after the system is air balanced, or any initial phases are balanced. This report may be hand written. Any systems that are not found to operate within the design tolerances by the Test and Balance Contractor shall immediately be reported to the Engineer via telephone call to attempt to determine a resolution while the Test and Balance Contractor is still on site. Additional compensation will not be accepted for additional trips.
- 2.14 Anticipate visiting the site again after the Engineer has reviewed the report. The Engineer may request up four (4) additional site visits for onsite troubleshooting where additional measurements may be required.
- 2.15 For the purpose of placing the Heating, Ventilating and Air Conditioning systems in operation according to design conditions and certifying same, final testing and balancing shall be performed in complete accordance with AABC Standards for Total System Balance, 7<sup>th</sup> edition for air and hydronic systems as published by the Associated Air Balance Council.
- 2.16 THE FOLLOWING SYSTEMS SHALL BE TESTED AND BALANCED:
- The supply, return, and outside air duct systems associated with all AHUs. Provide static pressure profiles thru each system. Static pressure profiles shall include all sections from the return duct inlet and supply duct outlet of the units. Show accurate representation of return, relief, outdoor and economizer damper locations. Balance minimum outside air at value indicated.
  - Verify calibrations of the duct static pressure for all systems.
  - Balance all supply and exhaust air grilles to within 10% of design air flow rate.
  - Balance all exhaust air fans and record inlet static pressure.
  - The supply and outside air systems associated with each energy recovery units.
- 2.17 Balance all units rated for 2,000 cfm unit such that the total air volume delivered does not exceed 2,000 cfm, otherwise the Contractor shall furnish and install a code compliant duct smoke detection system integrated into the building's system.
- 2.18 Balance the water flow rate of each domestic hot water recirculating pump. Set the flow rate for each balancing valve in the recirculating hot water system. If flow rates are not indicated, contact the engineer for each balance valve GPM.
- 2.19 Instruments used for testing and balancing of air and hydronic systems shall have been calibrated within a period of six months prior to balancing. All final test analysis reports shall include a letter of certification listing instrumentation used and last date of calibration.
- 2.20 Test and Balance agency shall provide sizing of fan or motor sheaves required for proper balance. The Mechanical Contractor shall purchase and install all sheaves and belts as required. This includes new and existing equipment.

- 2.21 Three (3) copies of the complete test reports shall be submitted to the Consulting Engineer prior to final acceptance of the project. Preliminary test reports shall be submitted when requested.
- 2.22 The Contractor shall provide and coordinate work to provide sufficient time before final completion date so that tests and balancing can be accomplished and provide immediate labor and tools to make corrections when required without undue delay.
- 2.23 The Contractor shall put all heating, ventilating and air conditioning systems and equipment and rangehood system into full operation and shall continue the operation of same during each working day of testing and balancing.
- 2.24 The Test and Balance Contractor shall be present during the Engineer's final inspection of the building, or a separate project review date. The Engineer may request confirmation of the air balance report by asking for new measurements to be taken at that time. Any information in the test and balance report may be asked to be reconfirmed.

**END OF TESTING, BALANCING, LUBRICATION, ETC.**

**SECTION 23 02 00 - HVAC EQUIPMENT**

**PART 1 – GENERAL:**

- 1.1 The Contractor's attention is directed to the General and Special Conditions, GENERAL PROVISIONS - MECHANICAL and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.
- 1.2 The Contractor shall provide in complete working order the heating, ventilation and air conditioning equipment located as indicated and installed, connected, and placed in operation in strict accordance with the manufacturer's recommendations. All equipment shall be factory painted and, where applicable, factory insulated and shall, where such standards exist, bear the label of the Underwriters Laboratory.
- 1.3 All Contractors and Vendors providing a bid for this project shall review the Plans and Specifications and determine any modifications and/or adjustments necessary relative to the proposed equipment and materials with specific manufacturer's installation requirements. Include in the bid any necessary installation methods, features, options, accessories, etc. necessary to install the proposed equipment and materials, regardless of whether used as basis of design or being offered as a substitution in accordance with the specific manufacturer's installation requirements whether specifically detailed or not within the Plans and Specifications.
- 1.4 All equipment, material and labor warranties shall be furnished by the equipment supplier/vendor. All warranties begin on the date of Substantial Completion. Refer to Specification Section GENERAL PROVISIONS – MECHANICAL for special warranty requirements.
- 1.5 Refer to Specification Section GENERAL PROVISIONS – MECHANICAL for minimum required Schedule of Values breakdown.
- 1.6 Review the Specification Section – REQUIRED SHOP DRAWINGS, ETC., and provide all documentations called for therein.
- 1.7 Each subcontractor shall be responsible for their own completion of System Verification Checklists/Manufacturer's Checklists. Refer to Specification Section GENERAL PROVISIONS – MECHANICAL for additional requirements. Factory startup is required for all HVAC equipment. In general, as part of the verification process, equipment suppliers shall perform start-up by their factory authorized technicians and shall complete and submit start-up reports/checklists.
- 1.8 All HVAC equipment shall comply with the latest provisions of ASHRAE Standard 90.1 and all provisions of the International Energy Conservation Code.
- 1.9 Ensure that the equipment that is proposed to be furnish may be installed, connected, placed in operation, and easily maintained at the location and in the space allocated for it.
- 1.10 The contractor and vendor shall confirm connection sides for each piece of equipment specific to this project.
- 1.11 Determine from the Bid Documents the date of completion of this project and ensure that equipment delivery schedules can be met so as to allow this completion date to be met.



- 1.12 Through coordination with other Contractors, Vendors and Suppliers associated with this Project, this Contractor shall ensure a complete, 100% functional, tested, inspected, and approved systems. Claims for additional cost or change orders will immediately be rejected. Refer to Specification Section - ELECTRIC MOTORS, ETC. for additional requirements. All equipment shall be furnished for a single point electrical connection unless specifically excluded as a requirement.
- 1.13 Review the Specification Section - CONTROLS to determine controls, including variable frequency drives, to be furnished. Where manufacturer's temperature controls are specified, they shall be in full compliance with NFPA 90A including automatic smoke shut down provisions.
- 1.14 Review the Specification Section – TESTING, BALANCING, LUBRICATION AND ADJUSTMENTS. For all belt driven equipment, provide final fan and motor sheaves as determined by the air balance contractor during project balancing phase. The mechanical contractor shall install any new sheaves and belts as required for balancing.
- 1.15 The owner is supply the VRF, ERUs and RTUs. The contractor is responsible for receiving, handling, transportation, instillation and startup of the equipment as required for a complete and working system.
- 1.16 Refer to the equipment schedules for additional equipment information.
- 1.17 The VRF system diagrams are included at the end of this section.

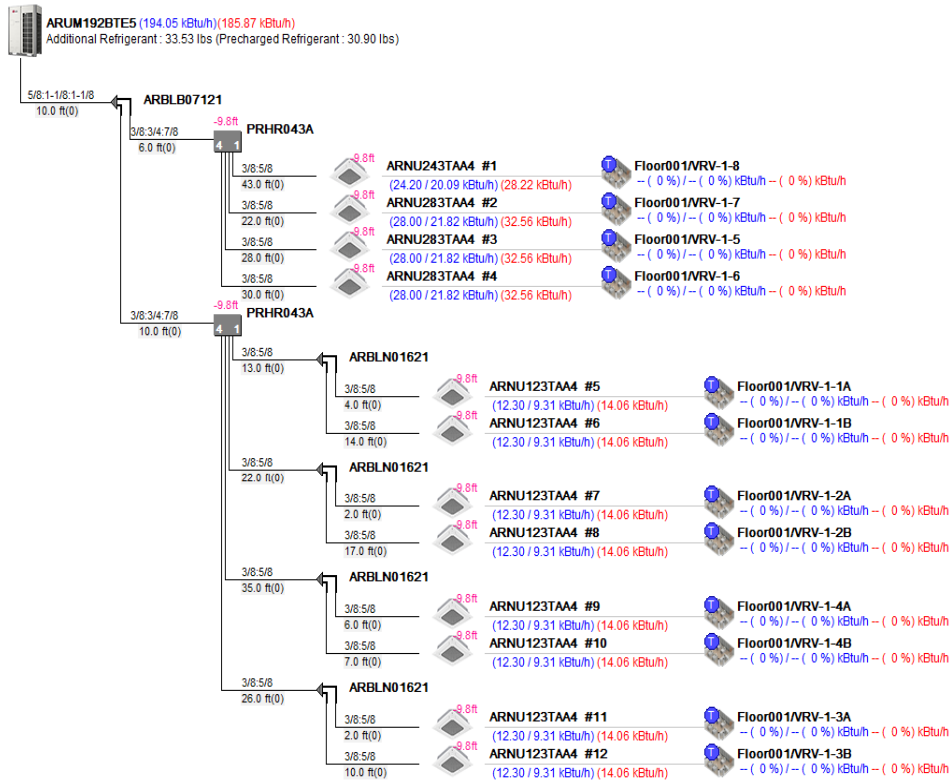
**END OF HAVC EQUIPMENT**

# System Tree Diagram

System Name: ACCU-1

**Date: 04/22/2024**

System No : 1/7



\* : Main pipe upsized  
 \*\* : Conditional Application  
**Three pipe** : Liquid : High Gas : Low Gas  
**Two pipe** : Liquid : Gas

Thermostat, 
 Group Control, 
 Dry Contact, 
 EEV Kit for Multi V Indoor  
 AHU Comm. Kit [Discharge (supply) air], 
 AHU Comm. Kit [Return air]  
 AHU Comm. Kit [Main module], 
 AHU Comm. Kit [Communications module]

**Indoor Units** : 12 of 32  
**Combination Ratio** : 204.0 of 192.0 (106%)  
**Total Pipe** : 307.0 of 3280.8 ft  
**ODU factory charge** : 30.90 lbs  
**Additional Refrigerant** : 33.53 lbs  
**Total refrigerant** : 64.43 lbs  
**Minimum room volume** : 2478.11 ft<sup>3</sup>  
 (Based on 26.0 lbs / 1000.0 ft<sup>3</sup>)

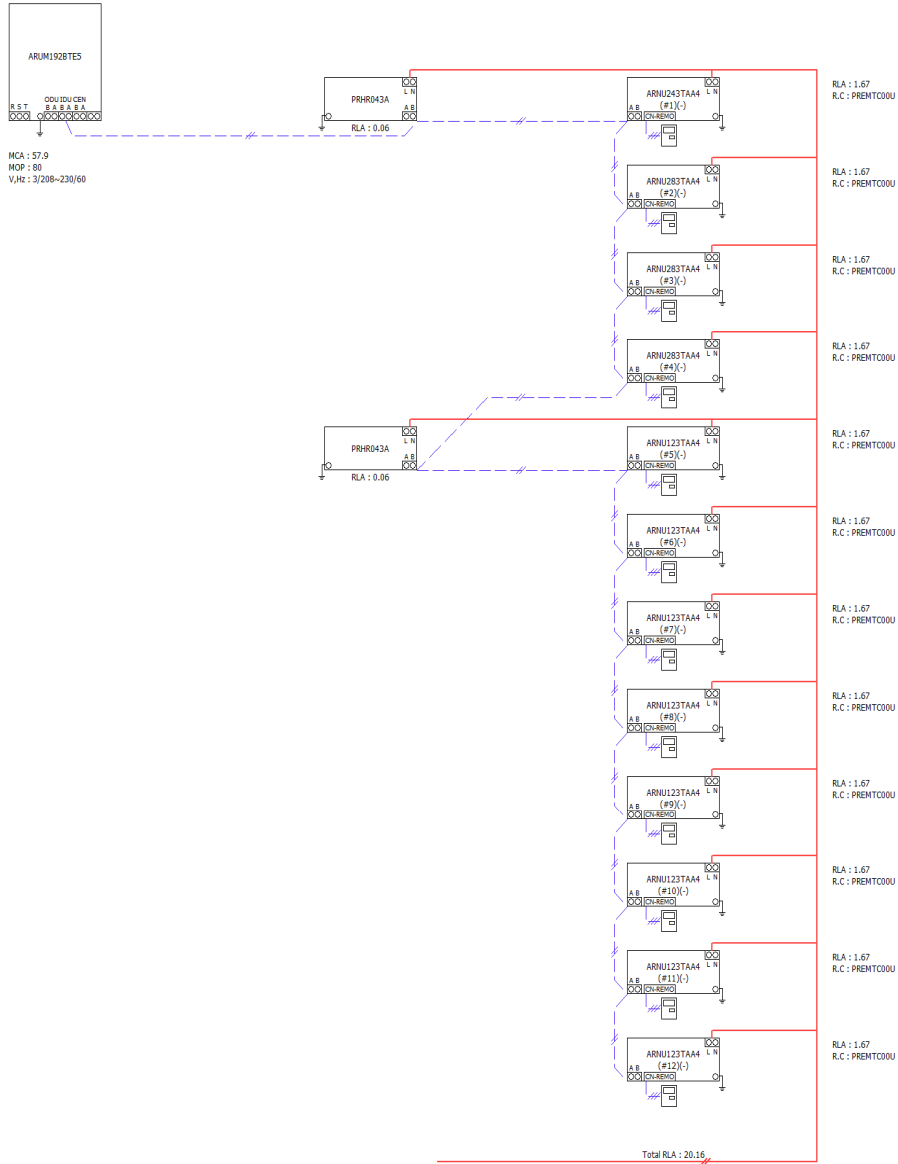
# System Schematic Diagram

System Name: ACCU-1

Date: 04/22/2024

System No : 1/7

- Power line(Outdoor unit)
  - Power line(Indoor unit /HR unit)
  - Communication line (ODU-IDU / ODU-ODU) : Twisted, Stranded and shielded AWG 18 x 2C
  - Communication line (ODU-CEN) : Twisted, Stranded and shielded AWG 18 x 2C
  - Communication line(Remote controller) : Twisted and stranded AWG 22 x 3C
  - Ground shield wire at ODU only
- Note : Polarity matters. Always connect 'K' to 'K' and 'B' to 'B'



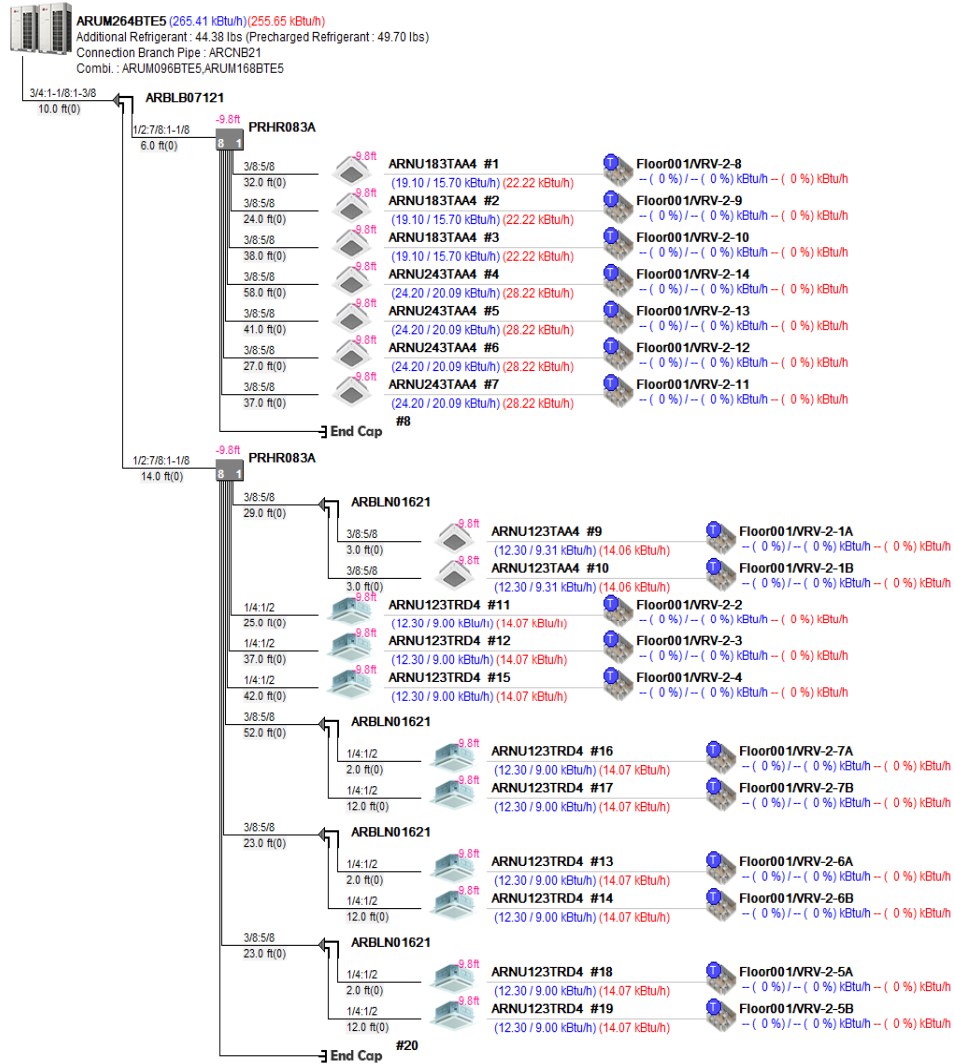
# Note :  
 Power wiring, breaker size, and disconnects should follow local code and NEC.  
 Multi-frame outdoor units require a separate power connection for each frame.  
 Refer to the most up-to-date submittal sheets for applicable electrical data.

# System Tree Diagram

System Name: ACCU-2

Date: 04/22/2024

System No : 2/7



\* : Main pipe upsized  
 \*\* : Conditional Application  
**Three pipe** : Liquid : High Gas : Low Gas  
**Two pipe** : Liquid : Gas

Thermostat, 
 Group Control, 
 Dry Contact, 
 EEV Kit for Multi V Indoor  
 AHU Comm. Kit [Discharge (supply) air], 
 AHU Comm. Kit [Return air]  
 AHU Comm. Kit [Main module], 
 AHU Comm. Kit [Communications module]

**Indoor Units** : 18 of 42  
**Combination Ratio** : 282.0 of 264.0 (107%)  
**Total Pipe** : 566.0 of 3280.8 ft  
**ODU factory charge** : 49.70 lbs  
**Additional Refrigerant** : 44.38 lbs  
**Total refrigerant** : 94.08 lbs  
**Minimum room volume** : 3618.45 ft³  
 (Based on 26.0 lbs / 1000.0 ft³)

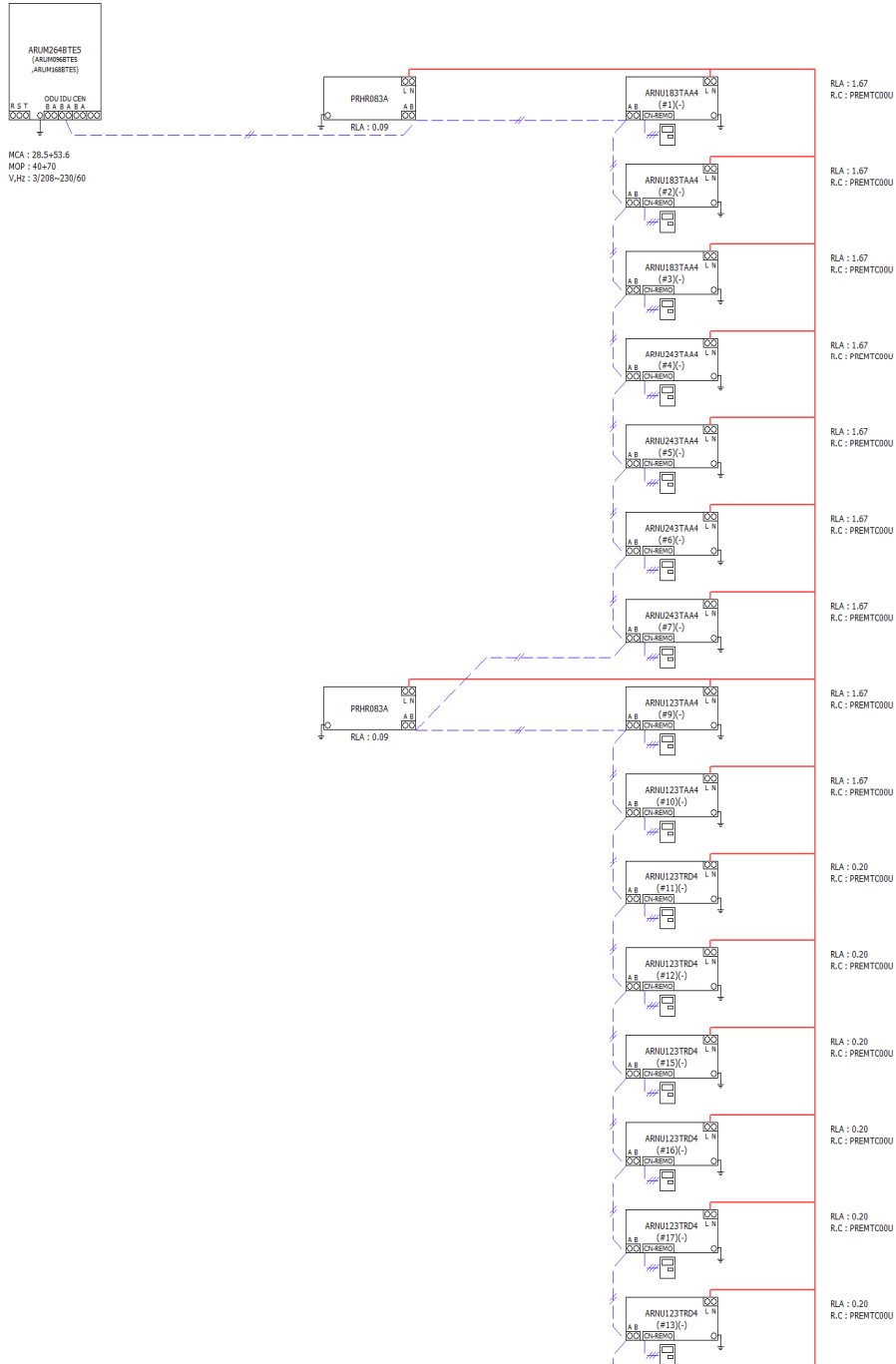
# System Schematic Diagram

System Name: ACCU-2

Date: 04/22/2024

System No : 2/7

- Power line(Outdoor unit)
  - Power line(Indoor unit /HR unit)
  - Communication line (ODU-IDU / ODU-ODU). Twisted, Stranded and shielded AWG 18 x 2C
  - Communication line (ODU-CEN). Twisted, Stranded and shielded AWG 18 x 2C
  - Communication line(Remote controller). Twisted and stranded AWG 22 x 3C
  - Ground shield wire at ODU only
- Note : Polarity matters. Always connect 'A' to 'A' and 'B' to 'B'

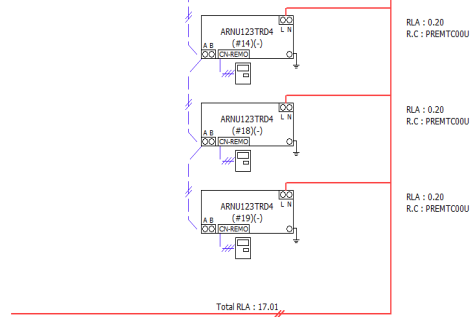


# System Schematic Diagram

System Name: ACCU-2

**Date: 04/22/2024**

System No : 2/7



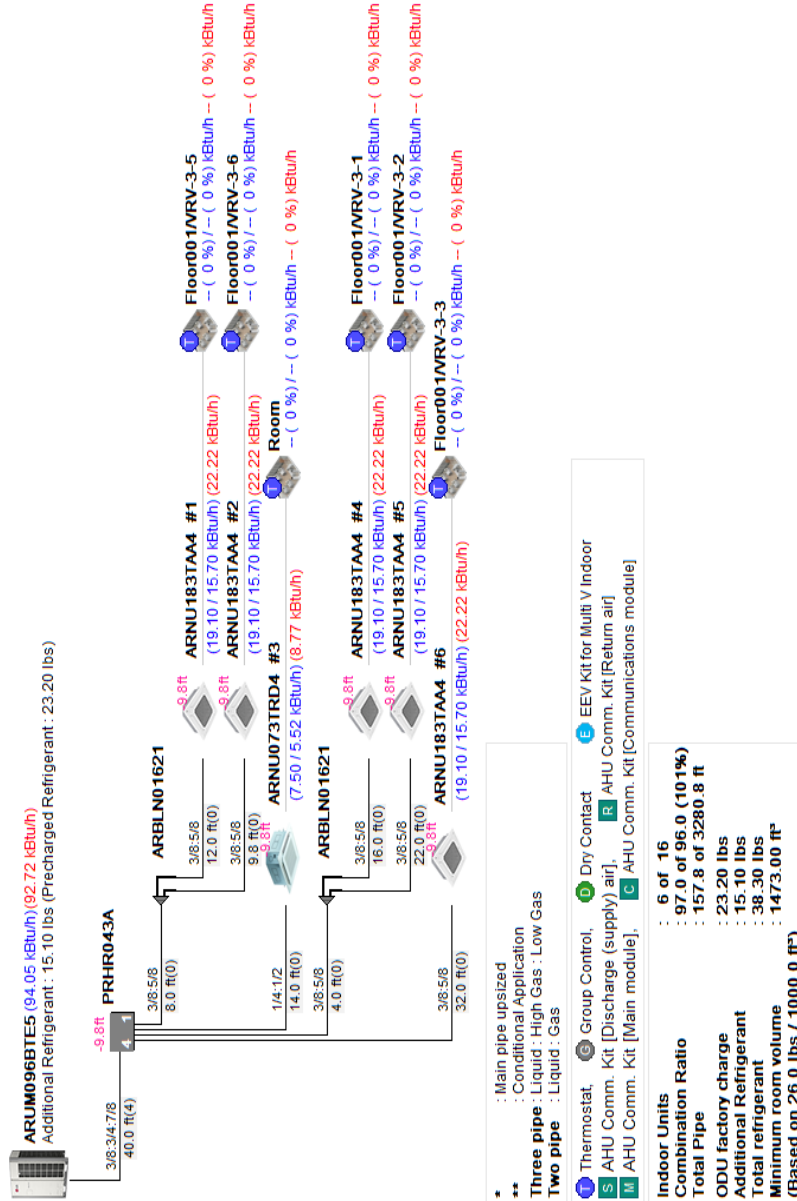
# Note :  
Power wiring, breaker size, and disconnects should follow local code and NEC.  
Multi-frame outdoor units require a separate power connection for each frame.  
Refer to the most up-to-date submittal sheets for applicable electrical data.

# System Tree Diagram

System Name: ACCU-3

Date: 04/22/2024

System No : 3/7

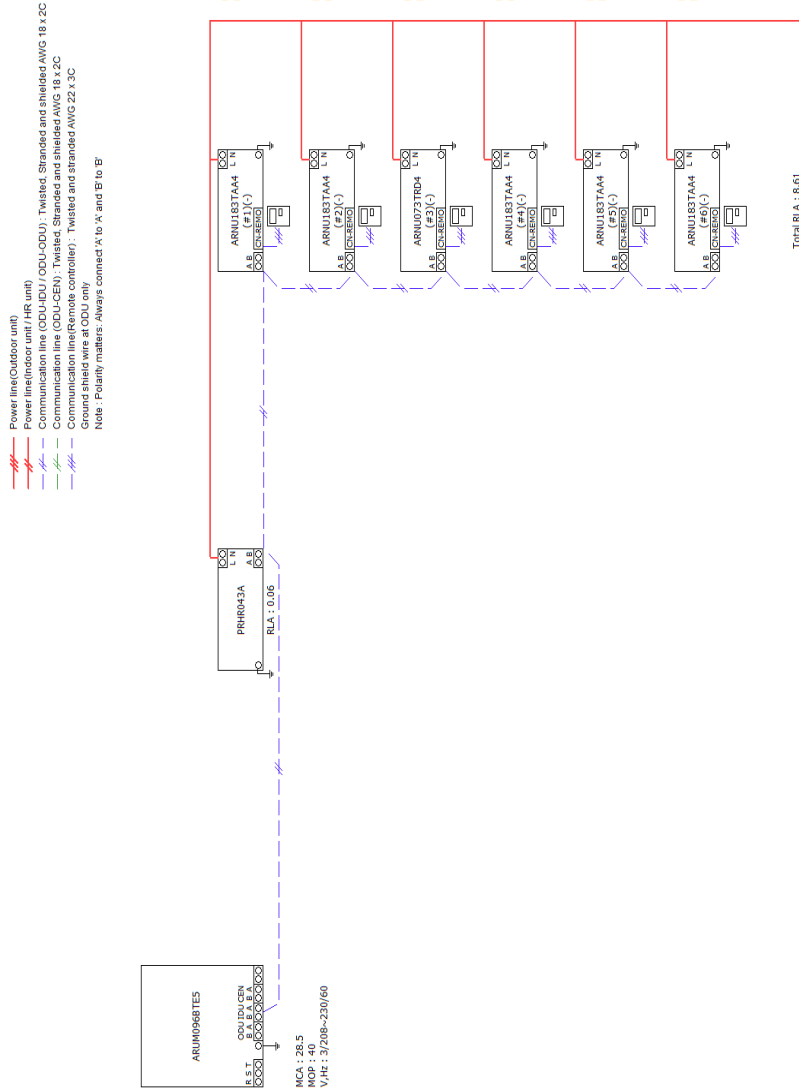


# System Schematic Diagram

System Name: ACCU-3

Date: 04/22/2024

System No : 3/7



# Note :  
Power wiring, breaker size, and disconnects should follow local code and NEC.  
Multi-frame outdoor units require a separate power connection for each frame.  
Refer to the most up-to-date submittal sheets for applicable electrical data.

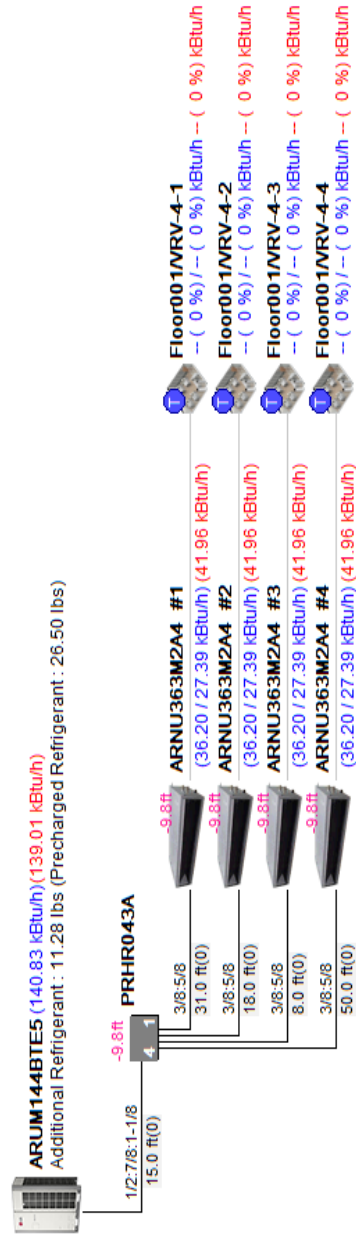


# System Tree Diagram

System Name: ACCU-4

Date: 04/22/2024

System No : 4/7



\* : Main pipe upsized  
 \*\* : Conditional Application  
**Three pipe** : Liquid : High Gas : Low Gas  
**Two pipe** : Liquid : Gas

T Thermostat, G Group Control, D Dry Contact, E EEV Kit for Multi V Indoor  
 S AHU Comm. Kit [Discharge (supply air)], R AHU Comm. Kit [Return air]  
 M AHU Comm. Kit [Main module], C AHU Comm. Kit [Communications module]

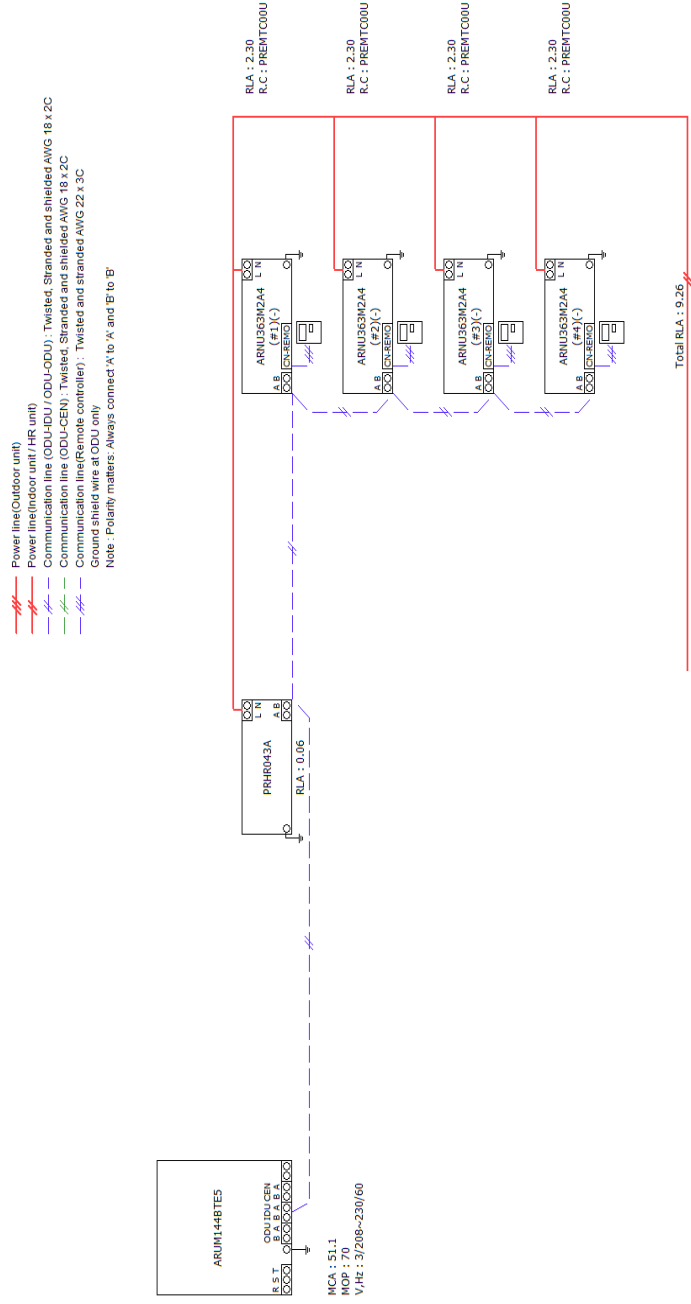
**Indoor Units** : 4 of 24  
**Combination Ratio** : 144.0 of 144.0 (100%)  
**Total Pipe** : 122.0 of 3280.8 ft  
**ODU factory charge** : 26.50 lbs  
**Additional Refrigerant** : 11.28 lbs  
**Total refrigerant** : 37.78 lbs  
**Minimum room volume** : 1452.99 ft<sup>3</sup>  
 (Based on 26.0 lbs / 1000.0 ft<sup>3</sup>)

# System Schematic Diagram

System Name: ACCU-4

Date: 04/22/2024

System No : 4/7



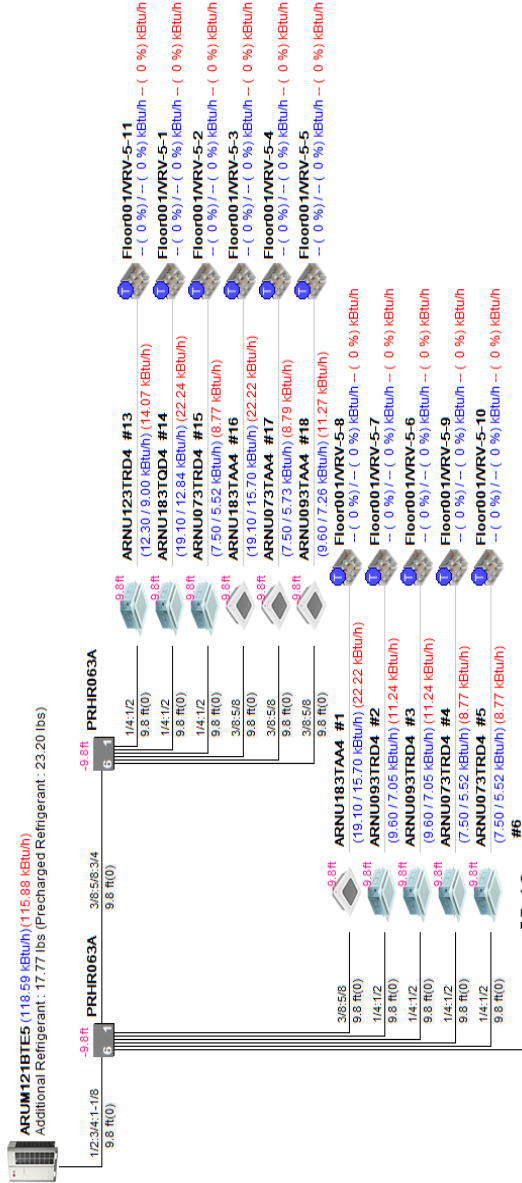
# Note : Power wiring, breaker size, and disconnects should follow local code and NEC. Multi-frame outdoor units require a separate power connection for each frame. Refer to the most up-to-date submittal sheets for applicable electrical data.

# System Tree Diagram

System Name: ACCU-5

Date: 04/22/2024

System No : 5/7



- \* : Main pipe upsized
- \*\* : Conditional Application
- Three pipe : Liquid : High Gas : Low Gas
- Two pipe : Liquid : Gas
- Thermostat
- Group Control
- Dry Contact
- EEV Kit for Multi V/Indoor
- AHU Comm. Kit [Discharge (supply) air]
- AHU Comm. Kit [Return air]
- AHU Comm. Kit [Main module]
- AHU Comm. Kit [Communications module]

Indoor Units  
 Combination Ratio : 11 of 20  
 Total Pipe : 121.0 of 120.0 (101%)  
 ODU factory charge : 23.20 lbs  
 Additional Refrigerant : 17.77 lbs  
 Total refrigerant : 40.97 lbs  
 Minimum room volume : 1575.83 ft³  
 (Based on 26.0 lbs / 1000.0 ft³)

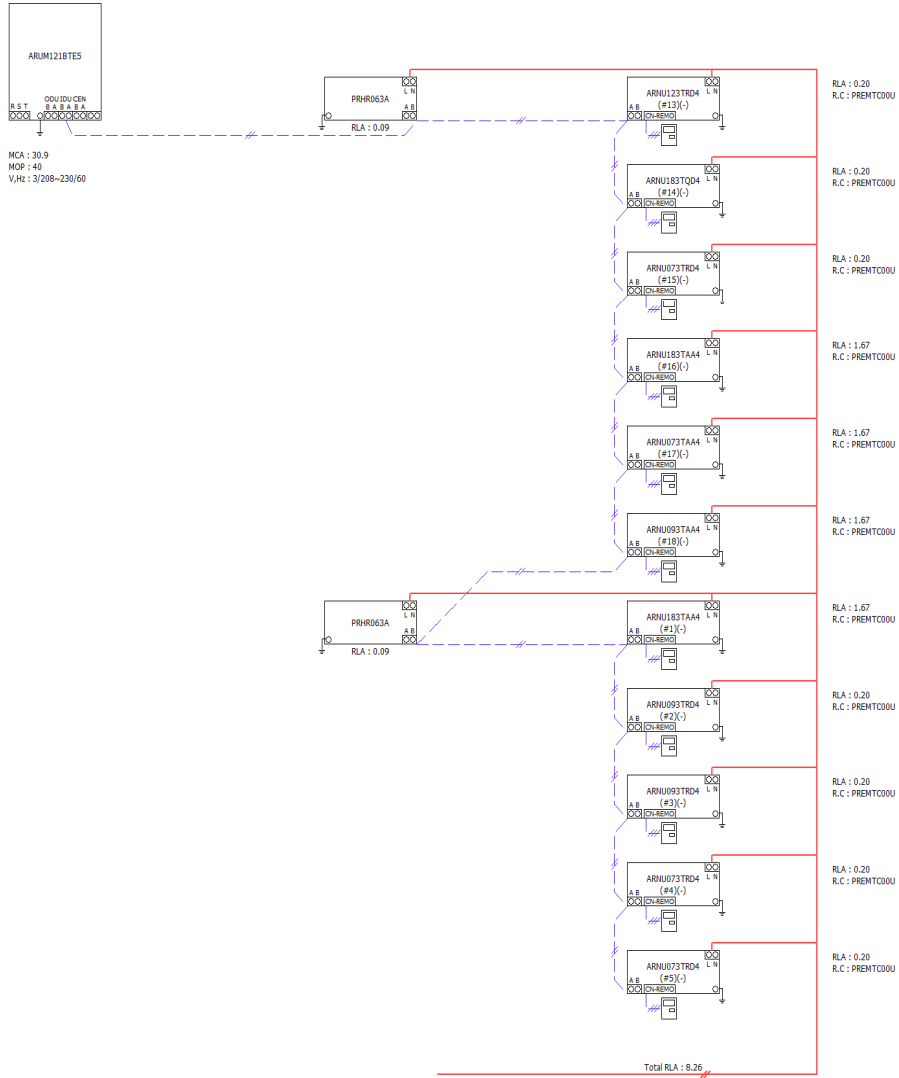
# System Schematic Diagram

System Name: ACCU-5

Date: 04/22/2024

System No : 5/7

- Power line(Outdoor unit)
  - Power line(Indoor unit / HR unit)
  - Communication line (ODU-IDU / ODU-ODU) : Twisted, Stranded and shielded AWG 18 x 2C
  - Communication line (ODU-CEN) : Twisted, Stranded and shielded AWG 18 x 2C
  - Communication line(Remote controller) : Twisted and stranded AWG 22 x 3C
  - Ground shield wire at ODU only
- Note : Polarity matters. Always connect 'A' to 'A' and 'B' to 'B'



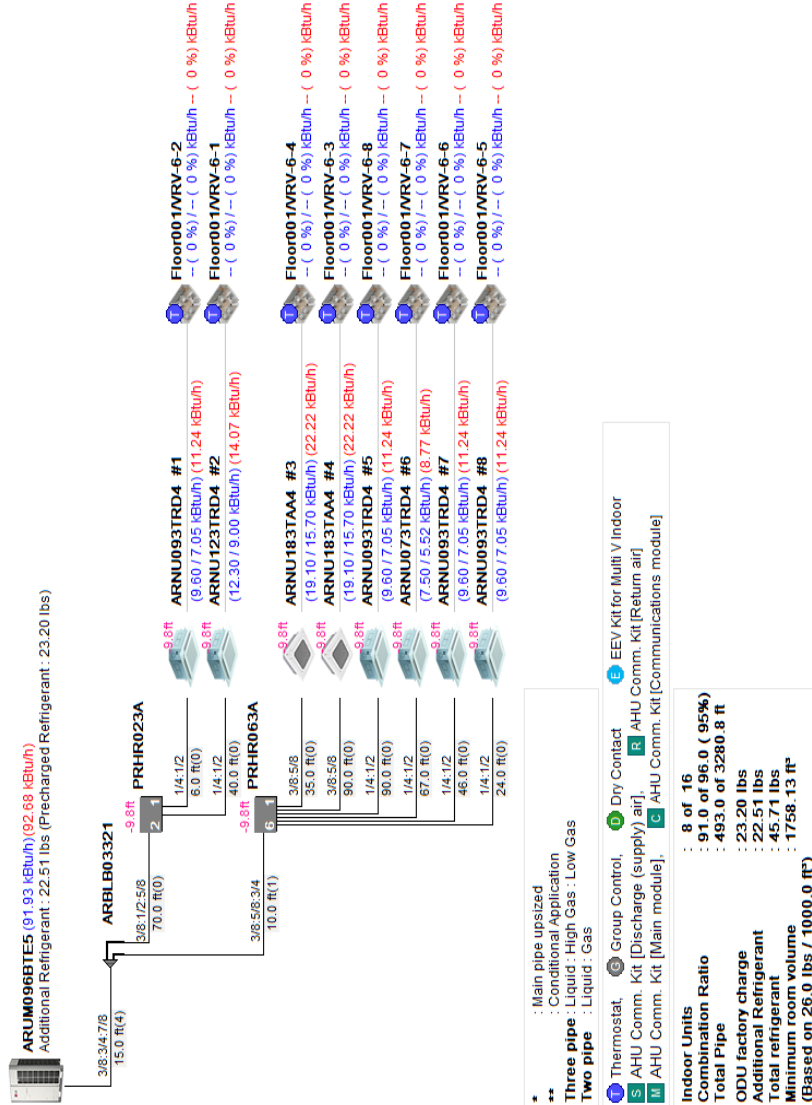
# Note :  
Power wiring, breaker size, and disconnects should follow local code and NEC.  
Multi-frame outdoor units require a separate power connection for each frame.  
Refer to the most up-to-date submittal sheets for applicable electrical data.

# System Tree Diagram

System Name: ACCU-6

Date: 04/22/2024

System No : 6/7



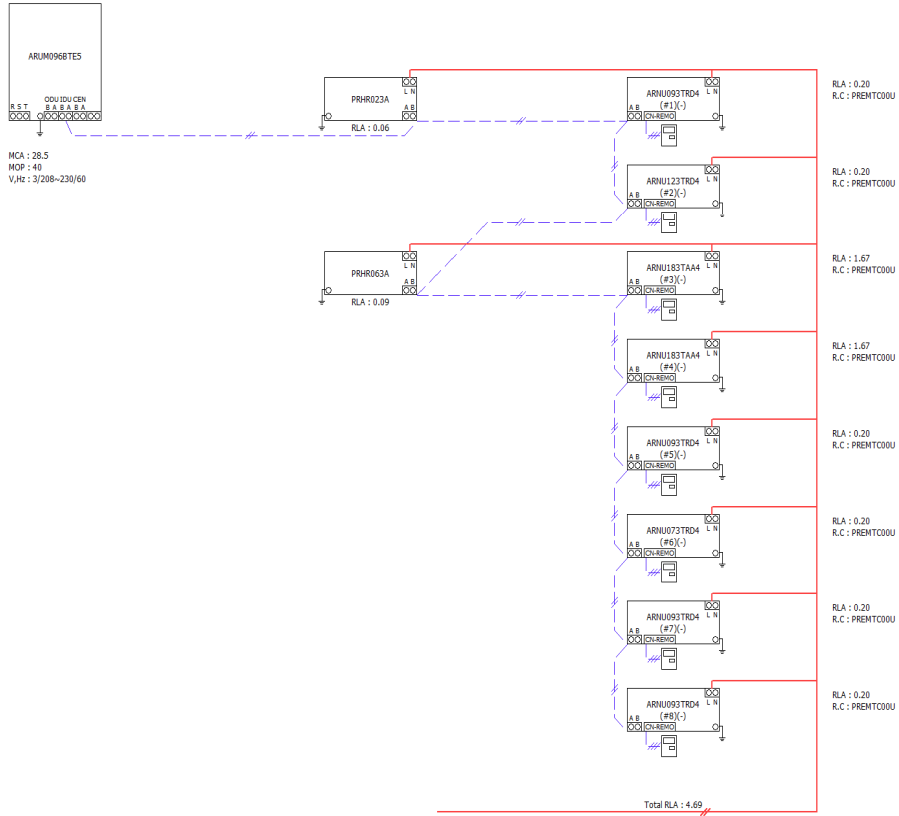
# System Schematic Diagram

System Name: ACCU-6

**Date: 04/22/2024**

System No : 6/7

- Power line(Outdoor unit)
  - Power line(Indoor unit / HR unit)
  - Communication line (ODU-IDU / ODU-ODU) : Twisted, Stranded and shielded AWG 18 x 2C
  - Communication line (ODU-CEN) : Twisted, Stranded and shielded AWG 18 x 2C
  - Communication line(Remote controller) : Twisted and stranded AWG 22 x 3C
  - Ground shield wire at ODU only
- Note : Polarity matters. Always connect 'K' to 'K' and 'B' to 'B'



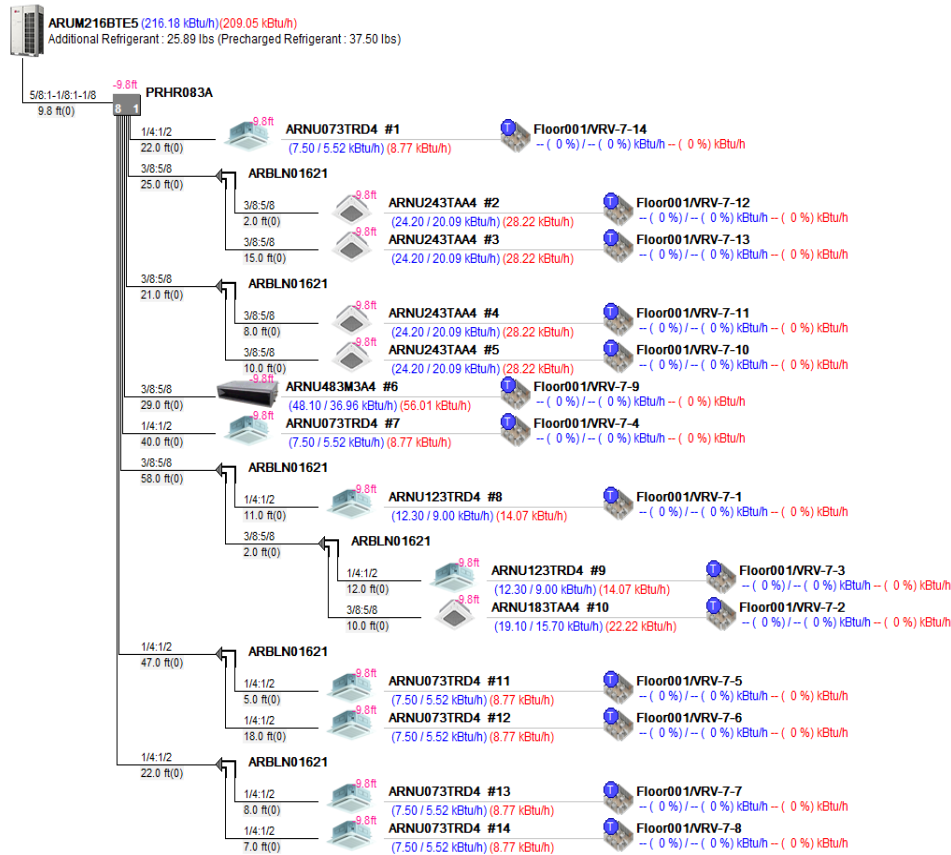
# Note :  
Power wiring, breaker size, and disconnects should follow local code and NEC.  
Multi-frame outdoor units require a separate power connection for each frame.  
Refer to the most up-to-date submittal sheets for applicable electrical data.

# System Tree Diagram

System Name: ACCU-7

**Date: 04/22/2024**

System No : 7/7



\* : Main pipe upsized  
 \*\* : Conditional Application

**Three pipe** : Liquid : High Gas : Low Gas  
**Two pipe** : Liquid : Gas

T Thermostat, G Group Control, D Dry Contact, E EEV Kit for Multi V Indoor  
S AHU Comm. Kit [Discharge (supply) air], R AHU Comm. Kit [Return air]  
M AHU Comm. Kit [Main module], C AHU Comm. Kit [Communications module]

Indoor Units	: 14 of 35
Combination Ratio	: 228.0 of 216.0 (106%)
Total Pipe	: 381.8 of 3280.8 ft
ODU factory charge	: 37.50 lbs
Additional Refrigerant	: 25.89 lbs
Total refrigerant	: 63.39 lbs
Minimum room volume	: 2438.25 ft³
(Based on 26.0 lbs / 1000.0 ft³)	

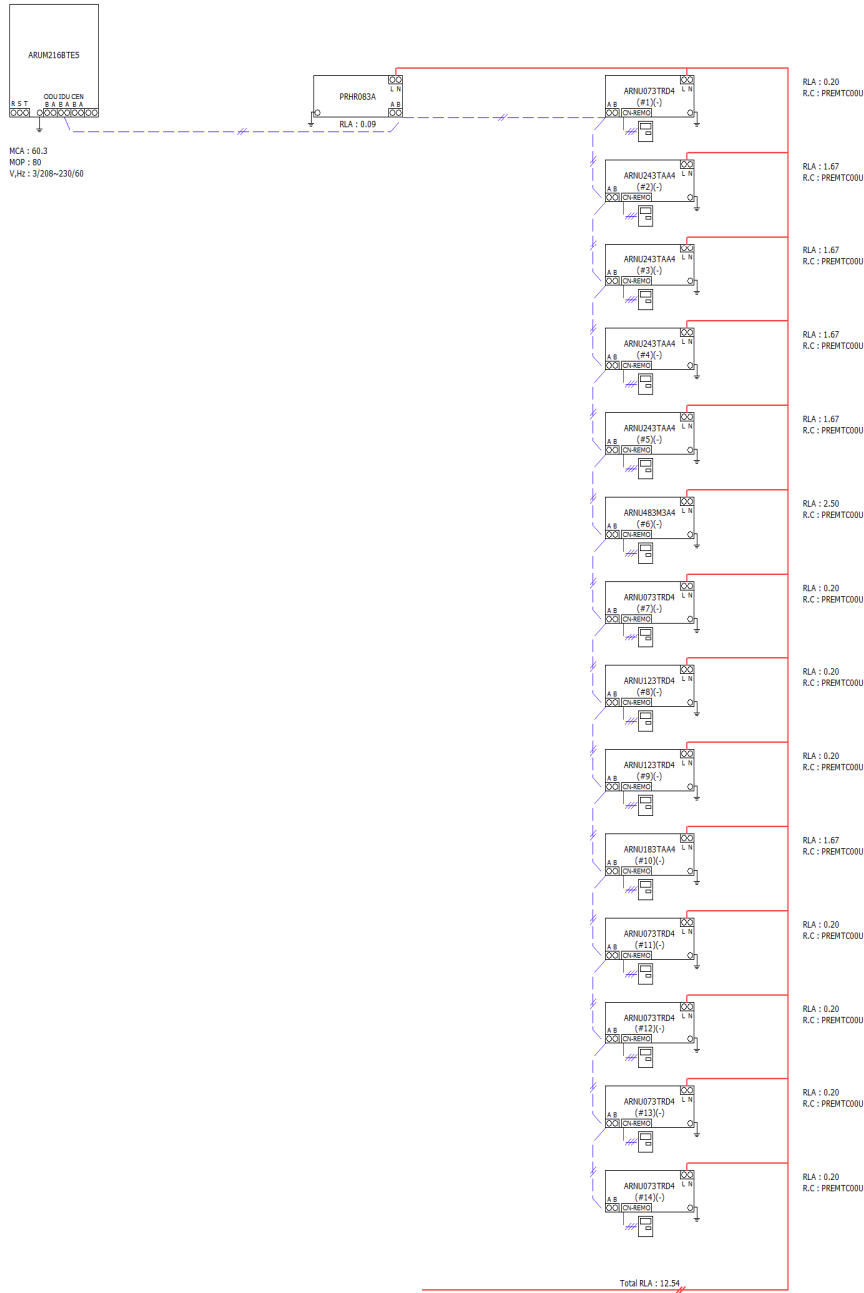
# System Schematic Diagram

System Name: ACCU-7

Date: 04/22/2024

System No : 7/7

- Power line(Outdoor unit)
  - Power line(Indoor unit /HR unit)
  - Communication line (ODU-IDU / ODU-ODU) : Twisted, Stranded and shielded AWG 18 x 2C
  - Communication line (ODU-CEN) : Twisted, Stranded and shielded AWG 18 x 2C
  - Communication line(Remote controller) : Twisted and stranded AWG 22 x 3C
  - Ground shield wire at ODU only
- Note : Polarity matters: Always connect 'N' to 'N' and 'B' to 'B'



# Note :  
Power wiring, breaker size, and disconnects should follow local code and NEC.  
Multi-frame outdoor units require a separate power connection for each frame.  
Refer to the most up-to-date submittal sheets for applicable electrical data.



**SECTION 23 12 00 - SHEET METAL**

**PART 1 – GENERAL:**

- 1.1 The Contractor's attention is directed to the General and Special Conditions, GENERAL PROVISIONS - MECHANICAL and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.
- 1.2 This branch of the work includes all materials, labor and accessories for the fabrication and installation of all sheet metal work as shown on the drawings and/or as specified herein. Where construction methods for various items are not indicated on the drawings or specified herein, all such work shall be fabricated and installed in accordance with the recommended methods outlined in the latest edition of SMACNA's Duct Manual and Sheet Metal Construction for Low Velocity Ventilating and Air Conditioning Systems. All equipment furnished by manufacturers shall be installed in strict accord with their recommended methods.
- 1.3 Ductwork shall be constructed and installed per the latest edition of the International Mechanical Code.
- 1.4 Ductwork shall be kept clean at all times. Ductwork stored on the job site shall be placed a minimum of 4" above the floor and shall be completely covered in plastic. Installed ductwork shall be protected with plastic. Do not install the ductwork if the building is not "dried-in". If this is required, the entire lengths of duct shall be covered in plastic to protect. The Owner/Engineer shall periodically inspect that these procedures are followed. If deemed unacceptable, the Contractor shall be required to clean the duct system utilizing a NADCA certified Contractor.
- 1.5 Prior to purchase and fabrication of ductwork (shop fabricated or manufactured), the Contractor shall coordinate installations with new and existing conditions. Notify the Engineer if there are any discrepancies for resolution.
- 1.6 For healthcare projects, provide a SMACNA duct cleanliness level "C" per the latest SMACNA standards.

**PART 2 – LOW VELOCITY DUCTWORK:**

- 2.1 Ductwork, plenums, and other appurtenances shall be constructed of one of the following: Steel sheets, zinc coated, Federal Specification 00-S-775, Type I, Class E & ASTM A93-59T with G-90 zinc coating. Aluminum alloy sheets 3003, Federal Specification AA-A-359, Temper H-14.
- 2.2 Ductwork, plenums, and other appurtenances shall be constructed of the materials of the minimum weights or gauges as required by the latest SMACNA 2" W.G. Standard or below table. When gauge thickness differs, the heavier gauge shall be selected. The below table shall serve as a minimum.

Round Diameter	Duct Gauge	Rectangular Width	Duct Gauge
3-12 Inches	26 Ga.	3-12 inches	26 Ga.
12-18 Inches	24 Ga.	13-30 inches	24 Ga.
19-28 Inches	22 Ga.	31-54 inches	22 Ga.
29-36 Inches	20 Ga.	55-84 inches	20 Ga.
37-52 Inches	18 Ga.	85 inches and up	18 Ga.

- 2.3 All ductwork connections, fittings, joints, etc., including longitudinal and transverse joints, seams and connections shall be sealed. Seal with high velocity, smooth-textured, water based duct sealant. Sealant shall be UL 181B-M listed, UL 723 classified, NFPA 90A & 90B compliant, permanently flexible, non-flammable, and rated to 15"wg. Apply per manufacturer's recommendations. Contractors shall ensure no exposed sharp edges or burrs on ductwork.
- 2.4 Duct dimensions indicated are required inside clear dimensions. Plan duct layouts for adequate insulation and fitting clearance.
- 2.5 All angular turns shall be made with the radius of the center line of the duct equivalent to 1.5 times the width of the duct.
- 2.6 Cross-break all ducts where either cross sectional dimension is 18" or larger.
- 2.7 Ducts shall be hung by angles, rods, 18 ga. minimum straps, trapezes, etc., in accordance with SMACNA's recommended practices. Duct supports shall not exceed 12 ft intervals. There shall be no less than one set of hangers for each section of ductwork. Where ductwork contains filter sections, coils, fans or other equipment or items, such equipment or items shall be hung independently of ductwork with rods or angles. Do not suspend ducts from purlins or other weak structural members where no additional weight may be applied. If in doubt, consult the Structural Engineer.
- 2.8 Double turning vanes shall be installed in square turns and/or where indicated.
- 2.9 Provide a "high efficiency" type take-off with round damper (Flexmaster STOD-B03 or approved equal) for all round duct branches from a rectangular main to a GRD. Refer to the detail on the drawings for all installation requirements.
- 2.10 Air volume dampers shall be installed in each duct branch takeoffs and/or where indicated, whichever is more stringent. All such dampers shall be accessible without damage to finishes or insulation and shall be provided where required for proper system balance.
- 2.11 Unless otherwise dimensioned on the drawings, all diffusers, registers, and grilles shall be located aesthetically and symmetrically with respect to lighting, ceiling patterns, doors, masonry bond, etc. Locate all supply, return, and exhaust diffusers and grilles in the locations shown on the architectural reflected ceiling plan.
- 2.12 The interior surface of the ductwork connecting to return/exhaust air grilles shall be painted flat black. The ductwork shall be painted a minimum of 24" starting from the grille.
- 2.13 Provide approved flexible connectors at inlet and outlet of each item of heating and cooling equipment whether indicated or not. Install so as to facilitate removal of equipment as well as for vibration and noise control.
- 2.14 All fans and other vibrating equipment shall be suspended by independent vibration isolators.
- 2.15 Miscellaneous accessories such as test openings with covers, latches, hardware, locking devices, etc., shall be installed as recommended by SMACNA and/or as indicated. Test openings shall be placed at the inlet and discharge of all centrifugal fans, VAV boxes, fan sections of air handling units, at the end and middle of all main trunk ducts and where indicated. All such openings shall be readily accessible without damage to finishes.
- 2.16 Whether indicated or not, provide code approved, full sized fire dampers at all locations where ductwork penetrates fire rated walls. Fire stop rating shall meet or exceed the rating of the wall.

- Provide an approved access panel at each fire damper located and sized so as to allow hand reset of each fire dampers. All such fire dampers and access panels shall be readily accessible without damage to finishes. Refer to Architectural Plans for locations of fire rated walls. All access doors shall be 16"x16" or as high as ductwork permits and 16" in length.
- 2.17 The Contractor who installs the sheet metal shall furnish to the Air Balancing Contractor, a qualified person to assist in testing and balancing the system.
- 2.18 INSULATED FLEXIBLE AIR DUCT: Thermaflex G-KM or equal. Flexible air duct shall be two (2) inch thick fiberglass insulation with CPE liner permanently bonded to a coated spring steel wire helix supporting a fiberglass scrim and fiberglass insulating blanket. Flexible air duct shall be listed under UL Standard 181 as a Class I flexible air duct complying with NFPA 90A and 90B. Maximum flame spread = 25 and maximum smoke developed = 50. Minimum insulating value is R-6.0. Flexible duct shall be used only for GRD runouts and no section shall be more than five feet in length.
- 2.19 FLEXIBLE CONNECTORS: Duro-Dyne, Ventfabrics, Inc., U.S. Rubber or equivalent; conforming to NFPA No. 90A; neoprene coated glass fabric; 20 oz. for low velocity ducts secured with snap lock.
- 2.20 TURNING VANES: Fabricated as recommended by SMACNA: noiseless when in place without mounting projections in ducts. All turning vanes shall be double blade type.
- 2.21 ACCESS DOORS IN DUCTWORK: Flexmaster TBSM, Air Balance, Vent Products or equal. Access doors for rectangular ducts shall be 16"x16" where possible. Otherwise install as large an access door as height permits by 16" in length. Door shall be 2" thick double-wall insulated with continuous hinge and cam lock. Provide in ducts where indicated or where required for servicing equipment whether indicated or not. Provide a hinged access door in duct adjacent to all fire, smoke, and control dampers for the purpose of determining position. Access doors shall also be provided on each side of duct coils and downstream side of VAV boxes and CAV boxes.
- 2.22 ARCHITECTURAL ACCESS DOORS IN CEILINGS OR WALLS: Provide Kees D Panel, Cescor, Milcor or equal. Panels shall be 24"x24" in size and constructed with 16 gauge galvanized steel for door and frame. Provide with primer finish to accept specified finish. Door shall include three (3) screwdriver operated cam latches and concealed continuous pivoting rod hinge. Door shall open 175 degrees. For masonry construction, furnish frames with adjustable metal masonry anchors. For fire rated units, provide manufacturer's standard insulated flush panel/doors with continuous piano hinge and self-closing mechanism. The Contractor shall include all required access doors in the bid and shall coordinate with the General Contractor prior to the bid to ensure a complete project.
- 2.23 SECURITY ARCHITECTURAL ACCESS DOORS IN CEILINGS OR WALLS: KEES Model number: SSAP-RR. Doors shall be 24"x24" in size with the following options: continuous internal hinged welded to door and collar; continuous door stops on 3 sides; 12-gauge steel door, flange and collar, collar stitch welded to flange with continuously welded seams; 3/8" radius on door and flange; pinned Allen head security cam latches; paintable finish; cylinder lock (coordinate cylinders and keys with Owner to match facility standards). Door shall open 150 degrees. For masonry construction, furnish frames with adjustable metal masonry anchors and straps. For fire rated units, provide manufacturer's standard insulated flush panel/doors with continuous piano hinge and self-closing mechanism. The Contractor shall include all required access doors in the bid and shall coordinate with the General Contractor prior to the bid to ensure a complete project.

- 2.24 VOLUME DAMPERS (RECTANGULAR): Ruskin MD35 or Air Balance, Pottorff, rectangular volume dampers. Frames shall be 16 gauge galvanized steel. Blades shall be opposed blade 16 gauge galvanized steel with triple crimped blades on 6" centers. Linkage shall be concealed in jamb. Bearings shall be 1/2" nylon. Maximum single section size shall be 48" wide and 72" high. Provide with Ventfabrics 2" high elevated dial regulator to avoid damper handle from conflicting with duct insulation. Provide permanent mark on dial regulator to mark air balance point.
- 2.25 VOLUME DAMPERS (ROUND): Ruskin MDRS25 or Air Balance, Pottorff round volume dampers. Dampers shall be butterfly type consisting of circular blade mounted to axle. Frames shall be 20 gauge steel and 6" long. Damper blades shall be 20 gauge crimped galvanized steel. Axle shall be 3/8"x6" square plated steel. Bearing shall be 3/8" nylon. Provide with Ventfabrics 2" high elevated dial regulator to avoid damper handle from conflicting with duct insulation. Provide permanent mark on dial regulator to mark air balance point.
- 2.26 FIRE DAMPERS: Fire dampers shall be Ruskin 1BD2 1 1/2 hour rating U-215B vertical 1 1/2 hour rating or United Air Type U-255B for a 3 hour vertical rating. Other acceptable manufacturers are Air Balance or Pottorff. Fire dampers shall be constructed and tested in accordance with UL Safety Standard 555. Each fire damper shall have a 1 1/2 or 3 hour fire protection rating as required by fire wall. Damper shall have a 165 degrees F fusible link and shall include a UL label in accordance with established UL labeling procedures. Fire damper shall be equipped for vertical or horizontal installation as required by the location shown. Fire dampers shall be installed in wall and floor openings utilizing minimum 20 gauge steel sleeves, angles, other materials, practices required to provide an installation to that utilized by the manufacturer when dampers were tested at UL. Blade and frame thickness shall be a minimum of 24 gauge. Installation shall be in accordance with the damper manufacturer's instructions. The blades shall be out of the air stream. Provide an access door for fire damper reset at all fire damper locations. Provide factory supplied caulked sleeve, gauge as required to meet manufacturer UL installation requirements.

**END OF SHEET METAL**

**SECTION 25 04 00 - CONTROL - DIRECT DIGITAL (WEB BASED)**

**PART 1 – GENERAL:**

- 1.1 The controls system for this project shall be a web-based digital controls system. All controllers, control interface hardware, services, installation, warranty, training, etc., shall be included as hereinafter specified. The system shall utilize a network controller and unitary" type controllers. Including such minor details not specifically mentioned or shown, as may be necessary for the complete operation of the system.
- 1.2 The Temperature Control Contractor (TCC) shall furnish all labor, materials, equipment, and service necessary for a complete and operating Building Automation System (BAS), utilizing Web Based Direct Digital Controls. All labor, materials, tools, equipment, software, software licenses, software configurations and database entries, interfaces, wiring, tubing, installation, labeling, engineering, calibration, documentation, samples, submittals, testing, commissioning, training services, permits and licenses, transportation, shipping, handling, administration, supervision, management, insurance, temporary protection, cleaning, cutting and patching, warranties, services, and items, even though these may not be specifically mentioned shall be included for the complete, fully functional and commissioned temperature controls system.
- 1.3 The TCC shall provide all items, articles, materials, devices, operations, or methods listed, mentioned, or scheduled on the drawings including all labor, materials, equipment, and incidentals necessary and required for their completion to provide a complete and operating temperature control system. This will include connecting to any mechanical equipment furnished with a control interface device and contacting the equipment suppliers and/or manufacturers for information for the proper interface to the equipment being furnished.
- 1.4 These apparatuses shall consist of, but not limited to, all necessary thermostats, sensing devices, valves, automatic dampers, damper motors, actuators, (except automatic dampers, valves, and damper motors furnished with HVAC equipment), and with the necessary accessories for the complete control of all equipment hereinafter specified.
- 1.5 Control sequences are specified at the end of this section. Provide all control equipment required to perform sequences described. Coordinate all dampers with the sheet metal contractor and equipment provider. It is the responsibility of the control contractor to ensure all required dampers in the sequence of operations are provided.
- 1.6 Include all power wiring and cabling for the operation of the controls system. Refer to Electrical Division Specifications for additional requirements.
- 1.7 APPROVED MANUFACTURER'S: Match existing
- 1.8 A mandatory pre-installation meeting shall occur prior to the TCC beginning any work on site. This meeting shall be attended minimally the prime contractor, mechanical contractor superintendent, TCC superintendent, Engineer, Owner, and Architect. The purpose of the meeting is to have the controls installer communicate their understanding of the system design and how the system is intended operate to the Engineer and get the Engineer's input and agreement. The agreement between the TCC and the mechanical engineer is to be thoroughly documented by the TCC for later reference.
- 1.9 The installation shall comply with the Local Authorities and State Fire Marshal code requirements, including normal operating and smoke mode functions (where applicable). The installation shall comply with the requirements of the NEC, NFPA, UL and the Building Codes, including referenced mechanical, electrical, energy codes, etc.

- 1.10 ABBREVIATIONS:
- TCC – Temperature Control Contractor
- 1.11 The TCC shall list the following cost breakdowns, material, and labor, on the official project schedule of values:
- Controls shop drawings
  - Controls graphics
  - Controls materials and labor
  - Controls startup, commissioning, testing, documentation (2.5% of controls contract value)
  - Controls training and Owner acceptance (2.5% of controls contract value)

**PART 2 – GENERAL SYSTEM REQUIREMENTS:**

- 2.1 All labeling for this system shall utilize actual final room names and numbers. The room names and numbers on the Contract Documents may not be the Owner's exact requirements. Coordinate with the Owner to ensure compliance.
- 2.2 Include in the bid for the Controls Contractor to perform additional 40 on-site hours of on-site programming, adjustments, modifications, etc. as requested by the Engineer during the warranty period after the date of substantial completion for the project.
- 2.3 All points of user interface shall be on standard PCs that do not require the purchase of any special software from the control's manufacturer for use as a building operations terminal. The primary point of interface on these PCs will be a standard Web Browser.
- 2.4 The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system integrated utilizing ANSI/ASHRAE Standard 135-2001 BACNet, OBIX TCP/IP, MODBUS, OPC, and other open and proprietary communication protocols in one open, interoperable system.
- 2.5 The TCC shall connect to any mechanical and electrical (power monitoring) equipment furnished with a control interface device. The TCC shall contact the equipment suppliers and/or manufacturers for information for the proper interface to the equipment being furnished. All points not provided with the equipment control interface are the responsibility of the TCC.
- 2.6 The operating system shall be based on a distributed control system in accordance with specifications. All building controllers, application controllers and all input/output devices shall communicate via BACnet MS/TP communication protocol. Network controller shall communicate via BACnet over Ethernet (IP).
- 2.7 The TCC contractor shall provide access to the system from a location determined by the Owner and from the Consulting Engineer's office (CMTA, Inc.). This shall include remote access requirements, set-up, passwords, and any software necessary to access the BAS system.
- 2.8 The TCC shall all have access to various types of WEB browsers (i.e. Netscape, IE, etc.), which shall be included for access to the Direct Digital Control (DDC) system via the Owner's Wide Area Network (WAN) and/or Local Area Network (LAN).
- 2.9 The TCC shall be responsible for coordination with the Owner's IT staff to ensure that their system will perform in the Owner's environment without disruption to any of the other activities taking place on that WAN/LAN.

### **PART 3 – SPECIAL PROJECT REQUIREMENTS**

- 3.1 If TCC needs to update or revise any of the existing software, to allow their software to operate seamlessly with the owners existing server, it will be completed by the TCC as a part of this contract.
- 3.2 If the existing building head end software needs to be updated or revised to communicate with TCC's software, it is to be completed by the TCC as a part of the bid.
- 3.3 All new software, graphics, terminology, operation, trending, scheduling etc. is match any existing systems and any changes needed to accomplish this will be the responsibility of the TCC.

### **PART 4 – SUBMITTALS:**

- 4.1 The TCC shall not start the project installation until the shop drawing submittals have been reviewed by the Engineer.
- 4.2 Submittals shall include hardware, end devices, ancillary control components, a written operating sequence, unitary control wiring, building floor plans showing communication cabling and labels as well as logic flow diagrams. All submittals shall be provided on paper and electronically in PDF format.
- 4.3 Submittals shall contain one control drawing per specified system and equipment. Drawing shall include point descriptors (DI, DO, AI, AO), addressing, and point names. Each point names shall be unique (within a system and between systems). For example, the point named for the mixed air temperature for AHU #1, AHU #2, and AHU #3 shall not be MAT but should be named AHU#1MAT, AHU#2MAT, and AHU#3MAT. The point names should be logical and consistent between systems and AHU's. The abbreviation or shorthand notation (e.g., MAT) shall be clearly defined in writing by the TCC.
- 4.4 Control diagrams shall identify: System being controlled (attach abbreviated control logic text, all digital points, analog points, virtual points, all functions (logic, math, and control) within control loop, legend for graphical icons or symbols, definition of variables or point names and detailed electric connections to all control devices and sensors.
- 4.5 Points list shall include all physical input/output. Points list shall be provided in both hard copy and in electronic format and shall include Name, address, engineering units, high and low alarm values and alarm differentials for return to normal condition, default value to be used when the normal controlling value is not reporting, message and alarm reporting as specified, identification of all adjustable points and description of all points.
- 4.6 Submittals shall contain floor plans depicting DDC control devices (control units, network devices, LAN interface devices, and power transformers as well as static pressure sensor in duct and temperature sensors in rooms) in relation to mechanical rooms, HVAC equipment, and building footprint.
- 4.7 Submittals shall contain DDC system architecture diagram indicating schematic location of all control units, workstations, LAN Interface devices, gateways, etc. Indicate address and type for each control unit, Indicate protocol, baud rate, and type of LAN per control unit.
- 4.8 Electrical wiring diagrams shall include motor start, control, and safety circuits and detailed digital interface panel control point termination diagrams with all wire numbers and terminal block numbers identified. Indicate all required electrical wiring. Provide panel termination drawings on separate drawings. Clearly differentiate between portions of wiring that are existing, factory-installed and portions to be field-installed.

- 4.9 Show all electric connections of the controls system to equipment furnished by others complete to terminal points identified with manufacturer's terminal recommendations.
- 4.10 TCC shall provide one complete drawing that shows the control-wiring interface with equipment provided by others.
- 4.11 Submittals shall include project specific graphic screens for each system including a picture of the screen with a list of the variables to be placed on the screen.
- 4.12 Submittals shall include TCC's hardware checkout sheets and test reports.
- 4.13 Submittals shall include the agenda for approval by the engineer and owner of the specified training periods. See training section for requirements.
- 4.14 Provide complete panel drawings that are:
- Clearly labeled and schematic or drawn to scale.
  - Show the internal and external component arrangement so that the operators can identify the components by their position if the labels come off.
  - Wiring access routes shall also be identified so that Class 1 wiring is separated from Class 2 and 3 and so high voltage wiring is segregated from low voltage wiring.
  - Complete identification of all control devices (manufacturer's type, number, and function).
  - Provide details for labeling all wiring, control devices, and controllers.
  - Material and equipment descriptive material such as catalog cuts, diagrams, performance curves, and other data to demonstrate conformance with specifications shall be provided.
- 4.15 Include room schedule including a separate line for each terminal unit, heat pump, etc. indicating location and address.
- 4.16 Include control valve schedules including a separate line for each valve provided under this section and a column for each of the valve attributes: code number, configuration, fail position, pipe size, valve size, body configuration, close-off pressure, capacity, valve Cv, design pressure, and actuator type.
- 4.17 Include control damper schedule including a separate line for each damper provided under this section and a column for each of the damper attributes, including code number, fail position, damper type, damper operator, duct size, damper size, mounting, and actuator type.

**PART 5 – O&M MANUALS AND CLOSEOUT DOCUMENTS:**

- 5.1 Refer to Mechanical Specification Section – REQUIRED SHOP DRAWINGS, ETC. for additional requirements.
- 5.2 Operating instructions, maintenance procedures, parts and repair manuals shall be supplied. Repair manuals shall include detailed instructions in the setup, calibration, repair, and maintenance of all equipment furnished. Also supplied with these manuals will be a complete parts listing of all devices supplied which is to include part numbers and model numbers of all parts and component parts along with exploded views of devices.
- 5.3 All as built drawings (wiring diagrams, flowcharts, floor plans, etc.) shall also be supplied to the owner electronically in PDF format.



- 5.4 System specific wiring, control diagrams, sequence of operation and points lists shall be as installed in each control panel. This means as-built drawings, not design (submittal) drawings.
- 5.5 Supply all software necessary for configuration of, modification, editing or communicating to any of the unitary devices. Software shall be capable of uploading and downloading the entire unitary data base or any part of the automated system for backup or archiving.
- 5.6 Supply one copy of the software programming manual (hard copy and PDF format). The manual shall describe all furnished software. The manual shall be oriented to programmers and shall describe calling requirements, data exchange requirements, data file requirements, and other information necessary to enable proper integration, loading, testing, and program execution.
- 5.7 Provide a Bill of Materials with each schematic drawing. List all devices/equipment and match to schematic and actual field labeling. Provide quantity, manufacturer, actual product ordering number, description, size, accuracy, operating ranges (voltage, temperature, pressure, etc.), input/output parameters, etc.
- 5.8 Maintenance manual shall include copies of signed-off acceptance test forms, commissioning reports, start-up reports, etc.
- 5.9 The TCC shall turn over to owner two (2) sets of computerized back-ups of the complete temperature control system.

**PART 6 – WARRANTY & SOFTWARE LICENSES:**

- 6.1 Labor and materials for the control system specified shall be warranted free from defects for a period of 12 months after substantial completion and acceptance. Control system failures during the warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to the Owner.
- 6.2 The TCC shall respond to the Owner's request for warranty service within 24 hours during normal business hours. The TCC shall respond to the Owner's request for Emergency service (defined as life-threatening or creating the potential to cause property damage) during the warranty period within 4 hours.
- 6.3 The TCC shall provide technical phone support to the owner during the warranty period for warranty related issues and for two years after the warranty period. If the technical support location of the TCC is outside of the toll-free calling area for the customer, the TCC shall have a toll-free number or accept collect calls for the purpose of providing technical support.
- 6.4 During the warranty period, standard parts for the DDC system shall arrive at the facility within 48 hours of placing an order. Non-standard parts (requiring re-manufacturing or ordering from another supplier) shall be shipped within 96 hours.
- 6.5 Operator workstation software, project-specific software, graphic software, database software, and firmware updates which resolve known software deficiencies as identified by the TCC shall be provided and correctly installed at no charge during the warranty period.
- 6.6 Provide licensed electronic copies of all software for each workstation, laptop, server. This includes but is not limited to project graphic images (editing/modifying/creating), project database, troubleshooting and debugging programs, project-specific programming code and all other software required to operate and modify the programming code (including software at system level, primary control units, secondary control units, and all communication software). Any hardware devices (cables, protection devices) required to operate the software/hardware shall also be provided.

- 6.7 All additional licensing needed for this project shall be supplied by TCC. Software license shall not expire or utilize any sort of protection hardware device for its use. In any case owner shall be free to direct the modification of any software license, regardless of supplier to allow open access to all controllers. Owner shall hold the software and firmware licensing. Software license shall not expire or utilize any sort of protection hardware device for its use.
- 6.8 System software shall be the latest version available with upgrades provided at the end of the warranty period and shall be fully licensed to the Owner for the entire system. Supply all software necessary for configuration of, modification, editing or communicating to any of the unitary devices. Software shall be capable of uploading and downloading the entire unitary data base or any part of the automated system for backup or archiving. Software shall be "IBM compatible".

**PART 7 – TRAINING:**

- 7.1 A formal on-site "Hands On" training session shall be conducted for the owner's maintenance personnel. This session shall be a minimum of one (1) eight (8) hour days to train the staff on setup, operation, and maintenance of all system(s) and/or devices. This will be at a time and location selected by the owner. One (1) additional eight (8) hour session shall be provided as "opposite season" training – generally 6 months into the warranty period. One (1) additional eight (8) hour session shall be provided at a later date. (This may be requested any time during the warranty period.) All training materials and books shall be provided. Both sessions shall be given by the manufacturers "factory" technical representative. (This is defined as someone other than the installing contractor's representative.) All expenses are to be provided by the TCC. All training sessions shall be scheduled at owner's request.
- 7.2 TCC shall conduct training courses for designated personnel in operation and maintenance of system. Training shall be oriented to specific system being installed under his contract and shall be digitally recorded and submitted on DVD by the TCC.
- 7.3 Training shall be a mix of, test exercises, and actual keyboard entry and screen viewing at the operator's terminal. A curriculum shall be discussed and implemented based on the level of expertise of the employees. Hands-on experience and problem solving shall be emphasized.
- 7.4 If during any training session, the trainer/owner finds more than three (3) items that need repair, the training session will be immediately terminated. The session will be rescheduled for another date. The re-scheduled training session will be carried out at no additional cost to the Owner.
- 7.5 The training shall be oriented to making the owner self sufficient in the day-to-day use and operation of the DDC system.
- 7.6 Additionally, the training shall include:
- System start-up, shutdowns, power outage and restart routines, alarms, security levels, changing setpoints, changing schedules and other parameters, overrides, freeze protection, manual operation, return to automatic operation, and resetting equipment.
  - All screens shall be discussed, allowing time for questions.
  - Information specifically focused on showing the owner methods of troubleshooting the mechanical systems using the DDC.
  - Use of laptop and hand-held operator interface device, if applicable.
  - Creating, modifying, viewing, downloading, and reloading, trend logs.
  - Remote access to the system.
  - The other training sessions shall be oriented toward answering specific questions from Owner's staff.
  - The trainer must be well grounded in both DDC system operation and in mechanical systems

service and shall be the programmer.

- 7.7 This documentation and process shall be complete, approved and accepted by Engineer and Owner prior to acceptance. This information shall be documented as completed. A copy shall be delivered to the Engineer and Owner and included in the O&M manuals.

**PART 8 – COMMISSIONING & VERIFICATION, FUNCTIONAL PERFORMANCE TESTING & CHECKLISTS:**

- 8.1 100% compliance with the requirements of this section is a condition of the Owner's acceptance and start of the warranty period.
- 8.2 The TCC shall be responsible for completion of (1) their hardware checkout sheets and test reports, (2) Point-by-point confirmations of ALL points – this includes visual inspection of installed components, and (3) sequence of operation confirmation.
- 8.3 This documentation and process shall be complete, approved and accepted by Engineer and Owner prior to acceptance. This information shall be documented as completed. A copy shall be delivered to the Engineer and Owner and included in the O&M manuals. Each subcontractor shall be responsible for completion of their own System Verification Checklists/Manufacturer's Checklists. Sample checklists shall be submitted to the Engineer and Testing Agent for approval.
- 8.4 Air and water balancing shall be completed (and discrepancies resolved) before the TCC's final system check and before the acceptance test to be conducted in the presence of the Engineer.
- 8.5 Refer to Mechanical Specification Section – GENERAL PROVISIONS for additional information and requirements.

**PART 9 – WIRE MANAGEMENT, ELECTRICAL POWER, ETC:**

- 9.1 Refer to CABLING section of this specification for additional requirements.
- 9.2 Electrical work required for system interlock and installation of the temperature control system shall be included in the bid and installed per all applicable codes. Coordinate with other trades as required for installation of a complete system.
- 9.3 All wiring and cabling in mechanical and electrical rooms shall be in conduit. No wiring or conduit can be exposed to view in any other area. Conceal all wiring and cabling in conduit in wall from thermostats or other controls devices to above ceiling. Install conduit in wall from wall thermostats to above ceiling for cabling. Route wiring directly to cable tray from control points above the ceiling. Rough-in for control devices shall be in compliance with the requirements of the ELECTRICAL SPECIFICATIONS.
- 9.4 Any power for controls shall be fed from dedicated circuits in emergency electrical panels, when provided for a project, and shall not be obtained from receptacles, lighting, or equipment circuits. Unitary control power may be obtained from the equipment served. If power is obtained from the equipment served, the power may not be interrupted to the electronics if the equipment is off for any reason.
- 9.5 The TCC shall be responsible for the power source to any control panels, unitary controllers, etc. on any controlled equipment and all other control power requirements. This includes circuit breakers, wiring, conduit, etc. installed in strict accordance with NEC. The TCC may contract with the electrical contractor for the power wiring installation.

- 9.6 Prior to installation, ensure through coordination with all trades, that appropriate clearances (36" minimum) as required by the N.E.C. are maintained at all control panels, including unitary controllers for VAV terminals, heat pumps, etc.
- 9.7 The TCC shall provide all CAT5 or CAT6 cabling network cabling for a complete system. This shall include cabling to the Owner's data drop. The main system data drop will be provided by others.
- 9.8 All control circuits within the electrical panels shall be marked to indicate equipment served.
- 9.9 The TCC shall perform all temperature control interlock wiring. This shall include control valves, dampers, thermostats, indoor/outdoor HVAC systems, etc. Electrical work required for system interlock and installation of the temperature control system shall be included in the bid and installed per all applicable codes. Coordinate with other trades as required for installation of a complete system.
- 9.10 The TCC shall be responsible for any power required for the unitary controls or control panels. This includes circuit breakers, wiring, conduit, etc. installed in strict accordance with NEC. The TCC may contract with the electrical contractor for the power wiring installation.
- 9.11 Provide one duplex outlet mounted inside the control panel and separately fused with a non-time delay fuse at 15 A at any panel location containing electronic control components. This receptacle may be served from the control panel 120 VAC power source.
- 9.12 All wiring shall be continuous runs. Any junctions must be made in metal enclosure.
- 9.13 Grounding terminals shall be color coded green and yellow and shall be compatible with the other specialty terminals specified above and shall mount on the same DIN rail system. Units shall be arranged so that the wiring connected to them is grounded to the enclosure via the mounting rail. These terminals shall be provided for grounding cable shields at the points where the cables enter a control panel and terminate on the control panel terminal strip. Terminals shall be Entelec M 4/5.3A.PI or equivalent by Weidmuller, Phoenix, or Allen Bradley.
- 9.14 The Department of Housing, Building and Construction's Electrical Division requires that all new lighting control panels, new Building Automation Systems control panels, and new conventional HVAC control panels be certified as being constructed and wired in accordance with NFPA 70 110.3 (a) (1) and article 409.
- 9.15 Contractor shall ensure control panels have an identification label stating the "Certification Agency" such as UL, CSA, CE, etc. or a label of certification for each control panel by a Professional Engineer (P.E.) registered in the State of Indiana, stating that the design of the control panel was under their direct supervisory control. Include with shop drawings.
- 9.16 The Electrical Advisory Council for the State of Indiana requires that only an electrical contractor licensed by the State of Indiana with a licensed Master Electrician and a licensed on-site electrician can install the electrical wiring for lighting controls systems or Building Automation Systems (BAS).

**PART 10 – CABLING:**

- 10.1 Refer to WIRE MANAGEMENT section of this specification for additional requirements.
- 10.2 ALL CONTROL WIRING SHALL BE INSTALLED IN A WIRE MANAGEMENT SYSTEM TO INCLUDE CABLE TRAYS, BRIDLE RINGS, & CONDUITS. NO EXCEPTIONS! COORDINATE WITH AN ELECTRICAL CONTRACTOR TO ENSURE A COMPLETE WIRE MANGEMENT SYSTEM.

- 10.3 Acceptable cable manufacturers are Belden, West Penn, or Alpha.
- 10.4 A complete cabling system shall be furnished and installed, which shall adhere to the highest workmanlike standard of quality and appearance. Cabling shall be installed square with building lines and contained within a wire management system.
- 10.5 All sizing of cabling shall be according to manufacturer's recommendations but shall be a minimum of 18 AWG.
- 10.6 Furnish a floor plan of the building indicating communication cable labeling and routing as well as addresses and branch wiring from the unitary devices. All cabling shall be labeled on both ends. The type, size and label of all cabling shall be indicated on submittal floor plan drawings.
- 10.7 Wall space temperature sensor cabling (from the sensor to the unitary controller) shall have a minimum of four (4) conductors.
- 10.8 All cabling shall be stranded. "NO" solid conductors will be accepted. All cabling shall be 100% shielded with appropriate drain wire and insulation.
- 10.9 All cable connections shall be continuous run (including shield). Any junctions must be made in a metal enclosure, connections must be soldered, taped and the metal enclosure must be mechanically attached to the nearest ground. No wire nuts or crimped connections will be accepted. Note location of junction boxes on the as built floor plans. All cabling networking unitary controllers, and other networked equipment, shall be in soldered.
- 10.10 All shields must be terminated as per manufacturer's recommendation. Shield termination requirements by the manufacturer must be provided with submittals.
- 10.11 Wireless controllers are not approved unless specifically mentioned in the sequence of operations or noted on plans.

**PART 11 – SYSTEM SOFTWARE:**

- 11.1 System software will be the latest version available with upgrades provided for full warranty period and shall be fully licensed to the owner for all network controllers and servers. Refer to WARRANTY section of this specification for additional requirements.
- 11.2 The BAS shall include trend logging screens accessible from tabs on the home page for building utilities usage.
- 11.3 System software shall, at a minimum, provide:
- Monitor and supervise all control points.
  - Add new points and edit system database.
  - Change control setpoints, timing parameters and loop tuning of PID coefficients in all control loops in all control units.
  - Enter programmed start/stop schedules.
  - View alarm and messages.
  - Modify existing control logic (or sequence of operation) in all control units.
  - Upload/Download programs, databases, control parameters, etc.
  - Modify graphic screens.

- 11.4 Sequence of operation programming methodology - The application software shall be user programmable. Application programming shall be (1) Line type programming that uses text programming in a language similar to BASIC or FORTRAN, or (2) graphical block programming - The method of programming shall be by manipulation of graphic icon "blocks." Each block represents a subroutine containing the programming necessary to execute the function of the device that the block represents.
- 11.5 Unitary Control Unit Database Archiving - The host software shall provide capability to upload sequence of operation, database, and other control parameters from each controller. Uploaded programs shall be retained on hard disk for system backup. Programs may be modified using Editor functions and downloaded to individual controllers as desired. Downloading of databases shall not interrupt other multi-tasked functions that are ongoing.
- 11.6 THIRD PARTY SOFTWARE PACKAGES: The host software shall provide the capacity to run third party software packages for word processing, spreadsheets, or database management programs. Use of third party software shall not suspend operation of background tasks of multi-tasking operating system, such as alarm logging, and report generation.

## **PART 12 – NETWORK CONTROLLER**

- 12.1 Install the Network Controller in a surface mounted panel, NEMA type 1 enclosures, with a removable hinged door. Provide a flush mounted key lock. All control panels must be painted the same color and identified. The boxes are to be made from 16 gauge material. Panels should not be provided with knockouts.
- 12.2 Control panels shall be constructed by a UL approved panel manufacturer. The standard used shall be UL508A. All proper labels are to be attached. Panel shall meet arc flash requirements.
- 12.3 The Network Controller shall be web-based and communicate BACnet IP. It shall issue all time schedules, summer/winter commands, customized trending, holiday scheduling, alarm handling, clock, or other shared commands to all unitary controllers within the building network. If for any reason communications between the unitary(s) and the Network Controller is lost, the unitary(s) shall operate in a stand-alone manner (in day operation) until communications is restored. It shall also operate in the "summer" or "winter" mode as last commanded.
- 12.4 The Network Controller shall be integrated and interoperable with the facility infrastructure and include user access to all system data locally over the Local Area Network (LAN) / Wide Area Network (WAN) within the building and remotely by a standard Web Browser over the Internet. Any computer connected to the network, utilizing a web browser, and having the proper password.
- 12.5 The Network Controller shall be a fully user-programmable, supervisory controller. It shall monitor the network of distributed unitary controllers, provide global strategy and direction, and communicate on a peer-to-peer basis with other Network Controllers.
- 12.6 The Network Controller shall have battery back-up to allow a minimum of seven days of operation. The Network Controller shall be composed of one or more independent, stand-alone, microprocessor to manage the network strategies described in Application software section. The network controller shall have ample memory to support its operating system, database, and programming requirements. The operating system of the Network Controller shall manage the input and output communications signals to allow distributed unitary controllers to share real and virtual point information and allow central monitoring and alarms. The database and custom programming routines of the Network Controller shall be editable from a single operator station.

- 12.7 The Network Controller shall be remotely monitored via the internet. Additionally, it shall include automatic emailing and texting out alarms, gathering alarms, reports and logs, programming and downloading database.
- 12.8 The Network Controller shall continually check the status of all processor and memory circuits. If a failure is detected, the controller shall:
- Assume a predetermined failure mode.
  - Emit an alarm.
  - Display card failure identification.
- 12.9 Under no circumstance shall more than 75% of the total number of sensor and control points be connected through a single Network Controller. Each DDC system component shall provide for the future addition of at least 20% of each type of the number of sensor and control points connected to that component including a minimum of one universal input and one universal output.

### **PART 13 – UNITARY CONTROLLER**

- 13.1 Unless otherwise specified, each piece of equipment shall have its own Unitary Controller (i.e., heat pump, AHU, terminal unit, etc.). The Unitary Controller for each piece of equipment shall be mounted on the side of the unit. The Unitary Controller for all other equipment shall be mounted in a panel and properly labeled.
- 13.2 Each Central Station Air Handler and/or Outside Air Unit shall have its own Unitary Controller mounted where shown on the drawings. If an installation location is not clear, the Contractor shall notify the Engineer for clarification prior to installation.
- 13.3 Unitary Controllers used in conditioned ambient shall be mounted in dust-proof enclosures, and shall be rated for operation at 32 degrees F to 120 degrees F. All Unitary Controllers shall have an RJ-11 or similar type connection for monitoring or programming access by room or local equipment level with access to any unitary within the network without modification.
- 13.4 Control panels shall be constructed by a UL approved panel manufacturer. The standard used shall be UL508A. All proper labels are to be attached. Panel shall meet arc flash requirements.
- 13.5 Unitary Controllers utilized in the network shall have full stand alone capability including time of day and holiday scheduling as well as all energy management functions such as optimal start/stop, duty cycling, etc. The terminal unit Unitary Controllers may be pre-programmed with the project specific sequence of operation as specified for the application. Any re-programming of the electronics shall be performed on location using a portable personal computer with appropriate software or through the Network Controller. The entire unitary data base shall have the capability of being backed up and or downloaded locally.
- 13.6 All points to have a unique digital input to the BAS system. The use of digital point count expanders is not an acceptable replacement to digital inputs to the unitary controller. The conversion of a single universal input channel to accept up to multiple voltage free contacts such as relay contacts, auxiliary starter contacts, differential pressure switches, etc. IS NOT ACCEPTABLE.
- 13.7 Unitary Controllers shall communicate via BACnet protocol. A BACnet Protocol Implementation Conformance Statement (PICS) shall be provided for each Unitary Controller that will communicate on the BACnet MS/TP Bus.

- 13.8 All Unitary Controllers shall be fully application programmable. All control sequences within or programmed into the unitary controller shall be stored in non-volatile memory, which is not dependent upon the presence of a battery shall be retained.
- 13.9 Unitary Controllers shall have a 10% spare point capacity to be provided for all applications.
- 13.10 The Unitary Controller for each VAV box shall be mounted on the side of the unit. The unitary controller for all other equipment shall be mounted in a panel and properly labeled. Prior to installation, ensure through coordination with all trades, that appropriate clearances (36" minimum) as required by the N.E.C. are maintained at all control panels, including unitary controllers for VAV terminals, etc.
- 13.11 After a power failure, the Unitary Controller shall operate the control application using the current setpoints and configuration. Reverting to default or factory setpoints are not acceptable.

**PART 14 – SENSORS AND MISCELLANEOUS DEVICES:**

- 14.1 **SENSOR RESOLUTION:** All temperature sensors shall have a minimum resolution of 1/10th of 1 degree F. (0.1 degree F.) Sensor stability shall be 0.24 degrees over a year period. Space sensors shall be tested and accurate to within 0.75 degrees F. Outside air, water and duct sensors shall be tested and accurate to within 2.0 degrees F.
- 14.2 **SPACE SENSORS AND THERMOSTATS:**
- Refer to the drawings for proper type and location.
  - All thermostat and sensors shall be provided with temperature indication, unless otherwise noted.
  - Programmed set-point shall be locally adjustable limited to 2 degrees above set-point and 2 degrees below set-point for supervised areas.
  - Unsupervised areas shall have non-adjustable set-point.
  - Generally, thermostats/sensors shall be installed 5'-0" above the finished floor.
  - Where thermostats/sensors are to be mounted next to a light switch, install at the same height as the light switch.
  - Sensors in hallways, vestibules, stairways, restrooms, and locker rooms shall utilize a stainless steel surface mount temperature sensor installed on an interior wall or partition (2"x4" blank plate). Care must be taken in the installation of these sensors to ensure proper insulation from the wall temperatures in order to properly sense space temperature.
  - If there is a question consult engineer prior to rough-in.
- 14.3 **WATER SENSORS:** Temperature sensors for water lines are to be the well type. Wells are to be threaded brass (same manufacturer as the temperature sensor) with the sensor coated with a heat transfer compound. Strap on sensors will not be acceptable.
- 14.4 **MIXED AIR SENSORS:** These sensors shall be bendable averaging, type made of copper or aluminum elements. In unit ventilators, these sensors shall be at least five (5) feet in length and installed in the discharge air of the unit. For Air Handling Units, Outside Air Units, etc. the sensors shall be at least 20 feet in length.
- 14.5 **DISCHARGE AIR AND DUCT ROOM RETURN AIR SENSORS:** Shall be rigid insertion type. In all applications, care shall be taken to ensure that the sensors are securely mounted as not to allow any vibration and installed in such a manner as to indicate the truest possible temperature.
- 14.6 **FREEZE/LOW-LIMIT THERMOSTAT:** Provide a freeze/low-limit thermostat in each Air Handling Unit, Outside Air Unit, etc with a water coil for freeze protection. These devices shall be the manual reset type. This device shall be wired by using a normally closed contact in series with the motor



starting circuit and a normally open set of contacts as an input to the unitary controller. The element shall be constructed of copper and be at least 20 feet in length. It shall be installed serpentine across the air entering the coil. In some cases, it may require being installed after the coil. Each application should be closely evaluated before installation. The device shall sense the lowest temperature by any one foot section of its element.

- 14.7 HUMIDITY SENSORS: These devices shall be 100% solid state, linear and temperature compensated with scaling 0-100% RH range with LED or LCD Display. Accuracy at 25°C from 10-80% RH\*  $\pm 2\%$ , operating Humidity Range 0 to 100% RH (non-condensing), Stability  $\pm 1\%$  @ 20°C (68°F) annually, for two years, Hysteresis 1.5% typical, Temperature Effect  $\pm 0.1\%$  RH/°C above or below 25°C (typical), 1% accuracy between 0% - 90% RH, Operating Temperature Range -40° to 50°C (-40° to 122°F)  $\pm 1\%$ .-Do not submit products that do not meet this range. The output of the device shall utilize an analog output 4-20 mA, 2-wire, polarity insensitive, (clipped and capped). The device shall use a power supply of 24 VAC or VDC. Duct mounted sensors shall have at least 4" insertion probe with a 16 gauge steel enclosure. NIST traceable certification shall be provided to the Engineer as part of the shop drawings. For wall mounted sensors the enclosure shall be polystyrene plastic mounted next to and at the same height as the temperature sensor in that area. Both shall have the same appearance. Provide protective cages in fitness and common areas.
- 14.8 COMBINATION TEMPERATURE/HUMIDITY SENSORS: All temperature sensors shall have a minimum resolution of 1/10th of 1 degree F. (0.1 degree F.) Sensor stability shall be 0.24 degrees over a year period. Space sensors shall be tested and accurate to within 0.75 degrees F. The humidity sensing device shall be 100% solid state, linear and temperature compensated with a 0-100% RH range. The response time shall be a minimum of 30 seconds for a 60% change. They shall have a minimum of 2% accuracy minimum accuracy of  $\pm 2\%$  RH minimum rangeability 5 to 95% RH non-condensing and maximum hysteresis  $\pm 1.5\%$  RH.- Do not submit products that do not meet this range. The output of the device must utilize a 0-10 VDC or 4-20mA signal as required. The device must use a power supply of 24 VAC or VDC. Duct mounted sensors shall have at least 4" insertion probe with a 16 gauge steel enclosure. NIST traceable certification shall be provided to the Engineer as part of the shop drawings. For wall mounted sensors the enclosure shall be polystyrene plastic mounted next to and at the same height as the temperature sensor in that area. Both shall have the same appearance. Provide protective cages in fitness and common areas.
- 14.9 LOW PRESSURE TRANSDUCERS: These devices shall be 100% solid state, linear and temperature compensated. Accuracy shall be no less than plus or minus 1% of its full range. Linearity, repeatability, and hysteresis shall be no less than plus or minus 0.1%. All pressure sensors shall utilize output averaging/output clipping to adjust and stabilize any fluctuations in the output. The output of the device shall utilize a 0 - 10 VDC signal. The device shall use a power supply of 24 VAC or VDC. The enclosure 16 gauge steel. For sensing internal static pressure of air handling ducts utilize sensors with a range of 0 to 5 inches water column. For sensing building static pressures (building compared to atmospheric) utilize a sensor with a range of -0.25 to +0.25 inches water column.
- 14.10 RELAYS: Relays for starting and stopping fractional horsepower motors shall be rated as follows:
- 1/4 horsepower motors or less use 15 ampere rated relays,
  - 1/3 horsepower motors use 20 ampere rated relays,
  - 1/2 horsepower motors use 30 ampere rated relays,
  - Relays used for pilot duty service shall be rated at a minimum of 10 amperes.
  - Provide auxiliary pilot duty relays on motor starters as required for control function.
  - Do not install control and status relays in packaged equipment control panel enclosures containing Class 1 starters.

- 14.11 CENTRAL STATION AIR HANDLERS: All Central Station Air Handlers, Outside Air Units, etc shall be provided with a D.A.P. (differential air pressure) switch across each the supply fan to provide fan status for each air handler.
- 14.12 SMOKE SHUTDOWN: All AHUs, OA units, Heat Pump Units, etc with fans of greater than 2,000 CFM are required to have smoke shutdown safeties as required by the Building Code. These smoke detectors shall have a set of auxiliary contracts wired to a dedicated input of the Unitary to provide status of the smoke detector. All units must be provided with a current sensor to provide fan status for each air handler. For projects with Outside Air (OA) units, any system fire alarm activation shall shutdown all OA units. Coordinate with the Fire Alarm Contractor to ensure a complete, code compliant installation.
- 14.13 CURRENT SENSING DEVICES: Veris Industries model Hx08 Series and H701 or equal. All current sensors shall be capable of alarming to the BAS for belt losses, pump coupling shear or other mechanical failure on loads.
- 14.14 DIFFERENTIAL PRESSURE TRANSMITTERS: Provide Rosemount (ITT Bell & Gossett ST-102R) or Johnson Controls Setra DPT 2302-050-V field mounted differential pressure sensor transmitters as indicated on the plans. Range shall be 0-25 psig. Accuracy shall be .025% full span.
- 14.15 CARBON DIOXIDE SENSORS: This sensor shall have a range of 0-2000 ppm +/-5% and +/- 50 ppm. Analog output of 0-10 or 2-10 VDC. Power shall be 24VAC. Calibration interval rated for 5 years. Sensor shall not be provided with a digital display. Honeywell Model C7232 or equal. A replacement CO2 sensor shall be installed annually for 5 years after substantial completion by the control's contractor. Provide with LED display.

**PART 15 - VALVES, DAMPERS AND ACTUATORS:**

- 15.1 Unless otherwise specified, valves shall be furnished and sized by the TCC. The valves are to provide the required capacity and the close off rating shall be in excess of the system pressures encountered (minimum 40 psi differential). Proportioning-type valve bodies shall be packed type with throttling type inner valve (quick close plug shall not be acceptable). Proportional type valves to be rated at 125 psi static pressure. Modulating control valves shall be selected within a 3-5 psig pressure drop range. Two position control valves (open/close) shall be line size.
- 15.2 Dampers for various units requiring field mounting shall be tight closing, "ultra low leakage", opposed blade with side and edge seals. They shall be sized and furnished under this section. Installation of dampers shall be by the sheet metal contractor, coordinated by the TCC. Frames shall be no less than 16 gauge galvanized steel and furnished with mounting holes for duct mounting. Damper blades shall be no less than 14 gauge galvanized steel with maximum blade width of 8 inches. Blades shall be secured to 1/2 inch zinc plated axles and hardware with nylon bearings. Provide thrust bearings at the end of each blade. All dampers shall have end switches to positively prove damper position. No Exceptions!
- 15.3 All damper and valve actuators shall be fail safe spring return type with sufficient force to operate the dampers or valves under all normal operating conditions. They shall return to the normally open position upon a loss of power. Exceptions to the spring return applications are (1) face and bypass actuators, (2) boiler 3-way loop mixing valves, (2) boiler room seasonal changeover valves. Actuators for fan coil units, terminal units, etc. shall fail in the last position.
- 15.4 "ALL" Act shall be Belimo and have internal feedback circuitry to provide a positive action to ensure proper positioning of the damper or valve through the entire sequence. Actuators shall have an adjustable starting point to accurately set the range of travel to the output of the controller. All actuators shall also utilize the same input signal (6-9 VDC, 0-010V, 2-10 VDC, 4-20 MA) in order to

maintain some consistency in the control application. Analog actuation is 6-9 VDC, 0-010V, 2-10 VDC or 4-20 MA, floating point control with 2 digital outputs is NOT approved as analog actuation.

- 15.5 Actuators may be factory installed. If not, factory installed, they shall be installed as per instructions by the terminal equipment manufacturer.
- 15.6 Locations mounted above ceiling shall be marked on ceiling grid.
- 15.7 Install damper motors on the outside of the duct in warm areas where possible, not in air stream or locations

**PART 16 - VARIABLE FREQUENCY DRIVES (VFDs):**

- 16.1 The work includes all labor, materials, and related items to completely furnish and install, start up and test, and place into service the Variable Frequency Drives (VFDs) indicated and scheduled on the Drawings and described in the Specifications.
- 16.2 VFDs shall be as manufactured by ABB. These are the only acceptable manufacturers. All VFDs for the project shall be by the same manufacturer (no exceptions).
- 16.3 VFDs shall consist of a pulse width modulated (PWM) inverter designed for use on a standard NEMA Design B induction motor.
- 16.4 The VFD shall be capable of operation from AC voltage in two ranges 208–240 VAC  $\pm$  10%, or 380–480 VAC  $\pm$  10%. 50/60 HZ operation,  $\pm$  2 hertz.
- 16.5 The VFD enclosure shall be rated UL type 1 and shall be UL listed as a plenum rated, suitable operating conditions: 0 – 40<sup>0</sup> C continuous. Drives that have thermal cut out circuits, or that cannot operate continuously at 40<sup>0</sup> C shall not be acceptable. Altitude 0 to 3300 feet above sea level, up to 95% humidity, non-condensing.
- 16.6 The VFD shall produce an adjustable AC voltage/frequency output for step less motor speed control utilizing sine wave coded Pulse Width Modulation (PWM) The Drive shall provide automatic power factor correction and a .98 displacement power factor by incorporating a full wave diode bridge rectifier. The VFD shall have an overload rating of 110% of nominal rated current for 1 minute out of every 10 minutes of operation, which is an acceptable overload for centrifugal loads.
- 16.7 The VFD shall include a built-in first environment RFI/EMI filter and be CE and UL labeled. It shall also meet the CE requirement of EN61800-3 which provides an actual test procedure that shows that the VFD is immune from RFI/EMI interference and at the same time does not emit RFI/EMI noise that would interfere with other sensitive equipment near the VFD.
- 16.8 The VFD shall include as a minimum a 5% dual DC link or AC line reactor for a clean harmonic signature, which aids in complying with IEEE-519-1992 recommended levels. The VFD manufacturer and representative shall assist in ensuring that the VFD's applied meet IEEE-519-1992 by completing a computer aided Harmonic Analysis of the complete system.
- 16.9 The VFD shall include as a standard a built-in digital keypad/display panel. This panel shall provide "Hand" off "Auto" selection, and a manual speed adjustment via up and down arrows. All faults and warnings shall be provided in "Plain English" for operation without a manual. The drive shall have a complete manual stored in memory that can be accessed with a single keystroke. This display shall be password protected and allow all setup parameters to be adjusted only by authorized personnel.

- 16.10 The VFD shall include built in Startup, Diagnostic, and Maintenance assistants, which allow for step-by-step startup procedures, troubleshooting, and the ability to indicate when the VFD and the system it is applied to needs preventive maintenance performed.
- 16.11 The VFD shall include a real time clock with a day/date stamp for troubleshooting purposes. In addition, with the use of this clock the drive shall be capable of stand-alone operation and act as a unitary controller.
- 16.12 The VFD shall include (2) Analog inputs either 4–20 mdc or 0-10 vdc, (6) programmable Digital Inputs, (2) Programmable analog Outputs, (3) Form C Relay output rated 2 amps continuous minimum, and (2) PID Process controllers.
- 16.13 The VFD keypad shall include a backlit LCD display. The display shall be in complete English words for programming and fault diagnostics (LED and alpha-numeric codes are not acceptable). All VFD faults shall be displayed in English words.
- 16.14 BYPASS: As scheduled on the drawings, the drive shall be provided with an integral Bypass circuit which includes a pair of 115V electrically interlocked contactors for drive and bypass operation. The drive shall include a main input circuit breaker, drive input service/isolation switch, and motor overload protection adjustable for either Class 10, 20 or 30 operation. The bypass shall include a built-in status display which shows via colored LED's the system operational status including safeties and run permissive for ease of operation. The Bypass shall have its own interactive, programmable keypad. The Bypass shall provide single-phase protection for the motor while operating in bypass. Bypass that does not protect the motor from single-phase operation shall not be acceptable.
- 16.15 The drive and bypass system shall have embedded serial communication capabilities that allow direct connection to Modbus, Johnson Controls, Siemens and BACnet automation systems as part of the drives software suite without the need for extra hardware cards or gateways. The connection shall be tested by the BACnet Testing Labs (BTL) and be BTL Listed. The BACnet interface shall conform to the BACnet standard device type of an Applications Specific Controller (B-ASC). In addition, the drive shall be capable of interfacing with Lonworks with the addition of a communication module.
- 16.16 All VFDs shall be provided and installed in strict accordance with the manufacturer's recommendations.
- 16.17 Factory-authorized startup for each drive is mandatory. Provide a written record of the startup of each unit. Start up and programming by a factory-authorized technician. At startup, lockout any speed with the VFD that does not meet the vibration allowed of the equipment manufacturers.
- 16.18 A parts and labor warranty of 3 years from startup and 2 years from the date of substantial completion shall be included. Warranty shall include travel time and expenses.

**PART 17 – GRAPHICS SCREENS AND TRENDS:**

- 17.1 All graphics screens shall be submitted for review by Engineer. Provide the following animated, color graphics screens minimally:
- 17.2 Entire floor plan home screen with OAT, Time, and Date displays.
- Floor plan showing major zones,
  - Click major zone displays enlarged floor plan of the zone showing individual heat pump zones & numbers. Include link to respective mechanical room.

- Click individual zone shows heat pump graphic. Display all data points from points list, occ/unocc schedule and setpoints, VAV cfm and setpoint, OAT, Time, and Date.
- 17.4 Graphics to include floor plans with room numbers (as-built room numbers) and thermostat locations, links to flow diagrams for heat pumps, zone dampers, hydronic loop systems, outside air systems, domestic hot water, and lighting controls.
- 17.5 All new graphics shall match the existing system graphics, unless noted otherwise.
- 17.6 The graphical programming software shall allow for interactive mouse-driven placement of block icons on the graphic screen and connection of block inputs to block outputs by means of drawing lines to form a graphic logic diagram. The user shall not have to manually input text to assign block input/output interconnections. Blocks shall allow entry of adjustable settings and parameters via pop-up windows.
- 17.7 The clarity of sequence shall be such that the user has the ability to verify that the system programming meets the specs without having to learn or interpret a manufacturer's unique programming language. Provide a means for testing and/or debugging the control programs off-line (not communicating with control units) using operator entered values for physical inputs and time. Provide a means for testing and/or debugging the control programs on-line (communicating with control units), showing actual physical inputs and all block outputs in real time.
- 17.8 Provide a utility that shall allow the graphic logic diagrams to be directly compiled into application programs. Logic diagrams shall be viewable either off-line, or on-line with real-time output values.
- 17.9 All graphic software shall be in the html web browser format and support multiple simultaneous screens to be opened and resizable in a "Windows" type environment. All functions, except text entry, shall be executable with a mouse. Graphic software shall provide for multitasking such that third party programs can be used while the Operator Workstation Software is on-line. Provide the ability to alarm graphically even when operator is in another software package. The software shall allow for Owner to create user defined, color graphic displays of geographic maps, building plans, floor plans, and mechanical and electrical system schematics.
- 17.10 The contractor shall provide libraries of pre-engineered screens and symbols depicting standard air handling unit components (e.g. fans, coils, filters, dampers, etc.), mechanical system components (e.g., pumps, heat pumps, etc.), complete mechanical systems (e.g. VAV, etc.) and electrical symbols.
- 17.11 The graphic development package shall use a mouse or similar pointing device to allow the user to perform the following:
- Define symbols
  - Position items on graphic screens
  - Attach physical or virtual points to a graphic
  - Define background screens
  - Define connecting lines and curves
  - Locate, orient and size descriptive text
  - Define and display colors for all elements
  - Establish correlation between symbols or text and associated system points or other displays.
  - Create hot spots or link triggers to other graphic displays or other functions in the software
- 17.12 The TCC shall including programming of 25 point trends as directed by the Engineer. These can be requested at any time during the project including the warranty period. Trend "change of state" for digital inputs. Trend analog points in 30 minute increments. Maintain trend history for 30 days.

## **SEQUENCE OF OPERATIONS**

### **PART 18 –CLASSROOM AIR HANDLING UNITS (UV-1A THRU 1D):**

- 18.1 Occupied/Unoccupied/Standby mode will be accomplished through an auto/unoccupied switch at the master control panel, the global controller time schedule, override time periods, or motion sensors in the room. Control of space temperature shall be accomplished using a discharge air reset routine.
- 18.2 The summer/winter mode will be determined by the summer/winter switch at the master control panel.
- 18.3 Thermostat: Unit thermostat is to be furnished and installed by the Controls contractor as noted on the drawings.
- 18.4 Occupied Winter Mode: The fan will run continuously. During warm-up, the outside air damper is closed. When the space temperature rises to within 2 degrees of setpoint, the outside air damper will open to minimum position (10% - adj.) and then be proportioned by the room sensor (set point and room temp.) to allow for up to 100% outside air. The low limit discharge air sensor will not allow the discharge air to go below 55 degrees F. The face and bypass damper is proportioned by the room temperature sensor to maintain room set point using a discharge air reset routine which will not allow the discharge air to go above 110°F (adj.). The unit is provided with an ECM motor and the fan speed shall be varied to maintain room setpoint. When the temperature begins to fall below setpoint the fan will be at minimum speed and the face and bypass damper will begin to open to face. When the face damper is 100% open, or full stroke limited by discharge high limit, the fan will modulate from minimum to full speed to maintain setpoint. When the temperature rises above setpoint the outside air will open to maintain setpoint. When outside air damper is 100% open, or full stroke limited by discharge low limit, the fan will modulate from minimum to full speed to maintain setpoint. The fan minimum speed shall be set to 30% (adj.) of total fan speed. TCC shall coordinate / verify the "minimum" fan speed with the unit manufacturer, so the fan does not shut-off at the minimum setpoint.
- 18.5 The set point for a classroom will be adjustable from 69 degrees F. to 73 degrees F. If for any reason power is interrupted to the VAHU is turned off the outside air damper will close.
- 18.6 Occupied/Standby Winter Mode: If an area is in occupied mode by time schedule or override time period and no motion is detected in a room for 15 minutes, the fan will shut off and the outside air damper will close. The room's set point will be reset to 68 degrees F. thru program logic. The fan will cycle off/on to maintain the lowered standby set point. The outside air damper will remain closed, and the face/bypass damper will remain under control of the room sensor. When motion is detected in the room (by motion sensor) the VAHU will return to normal occupied winter operation and follow the room's adjustable set point.
- 18.7 Unoccupied Winter Mode: The fan will shut off and will cycle off/on to maintain a lowered night setback temperature of 55 degrees F. with a 4 degree differential (on at 55 degrees F. and off at 59 degrees F.). The outside air damper will remain closed. Modulate the face and bypass damper to maintain a 70°F (adj.) discharge air temperature.
- 18.8 Occupied Summer Mode: The fan will run continuously. The outside/return air damper will go to minimum outside air position (10% adj.). The face/bypass damper is proportioned by the room sensor to maintain room set point. The fan speed shall be varied to maintain room setpoint. When the temperature rises above setpoint the fan will be at minimum speed and the face and bypass damper will begin to open to face. When the face damper is 100%, open the fan will modulate from minimum to full speed to maintain setpoint. The low limit discharge air sensor will be used to prevent diffuser

and ductwork condensation, maintaining the discharge air above 52 deg (adj) by opening the face and bypass damper to face.

- 18.9 The setpoint for classrooms will be adjustable from 73 Degrees F. to 77 Degrees F. The low limit discharge air sensor will not be used in the control sequence and will be for temperature indication only. If the space temperature is above 78 Degrees F. the outside air and return air damper will close to the outside air.
- 18.10 Occupied/Standby Summer Mode: If an area is in occupied mode by time schedule or override time period, and no motion is detected in room for 15 minutes, the fan will shut off and the room's set point will be reset to 78 degrees F. thru program logic. The fan will cycle off/on to maintain the raised standby set point. The outside air damper will remain closed, and the face/bypass damper will remain under control of the room sensor. When motion is detected in the room (by motion sensor) the unit will return to normal occupied summer operation and follow the room's adjustable set point.
- 18.11 Provide status of the unit via current switch suitable for a variable speed fan.
- 18.12 Units will be provided with a factory mounted freezestat. Wire one contact to stop fan and close outside air dampers. Wire second contact to provide freezestat alarm status.

**PART 19 – BUILDING EXHAUST FANS (EF-1B THRU -1D AND EF-3):**

- 19.1 The building exhaust fans shall operate continuously in the occupied mode. In the unoccupied building mode fans shall be off.
- 19.2 Fan status shall be monitored using a current sensor.

**PART 20 – EXHAUST FANS (W/ MANUAL SWITCH EF-1A):**

- 20.1 The exhaust fans noted above shall only operate when the line voltage switch/timer switch located in the room is turned to the "ON" position. Coordinate the wiring with the electrical contractor. Fan shall operate for (1) hour (adj.) after activation and automatically switch off.

**PART 21 – VARIABLE FREQUENCY DRIVES (VFD'S):**

- 21.1 VFD shall include a communications port for LonWorks or BacNet compatible protocol. Coordinate with TCC. Start-stop, status for chiller and control signal shall be hardwired. Provide input points for two preset speeds. Provide two programmable Form C relays rated 2 amps to activate At Speed for pump applications.
- 21.2 Current VFD status and operating conditions shall be monitored through its communications interface port. The following points shall be monitored and trended through the VFD interface as follows:

Point Name	Hardware Points				Software Points					Show On Graphic
	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm	
Motor Speed RPM					x			x		x
Motor Frequency Hertz					x			x		x
Motor Current Amps					x			x		x
Motor Runtime					x					x
VFD Status						x		x		x
In Fault Condition						x		x	x	x

Point Name	Hardware Points				Software Points					Show On Graphic
	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm	
In Bypass						x		x	x	x
<b>Totals</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>3</b>	<b>0</b>	<b>6</b>	<b>2</b>	<b>7</b>

**Total Hardware ( 0 )**
**Total Software ( 15 )**

**PART 22 – FAN COIL UNITS (2-PIPE):**

- 22.1 Fan coil units will be controlled by auto/unoccupied switch at the master control panel, time schedule, override time period, or motion sensors.
- 22.2 Fan coil units have a 2-way control valve. The temperature control contractor will provide a separate output to the valve so that the valve will close off water flow (2 minutes adj.) before the fan shuts off.
- 22.3 Occupied Winter or Summer Mode: The winter/summer mode will be selected by summer/winter switch at the master control panel. If there is communication failure between the global controller and the unitary controller the mode will be determined by an aqua thermostat located on the water supply lines. If the space is in occupied mode by time schedule or timed override, fan coil units that are used as the primary source of heat or cooling will cycle the fan from off to low then high speed based on the room temperature sensor and the room setpoint. The set points for winter will be 69 Degrees F. to 73 Degrees F. and for summer the set points will be 73 Degrees F. to 77 Degrees F in all supervised areas (class rooms, office areas, etc.). The set points for heat will be 68 Degrees fixed and for cooling the set points will be 78 Degrees fixed in all non-supervised areas (hallways, restroom, storage rooms, etc.). Use a ½ Degree F. between speeds with a ½ Degree F. dead band to cycle the fan off/on.
- 22.4 Occupied Winter or Summer Standby Mode: If an area is in occupied mode by time schedule or timed override and no motion is detected in a room for 15 minutes, the unit(s) will cycle by room temperature sensor based on a programmed set point of 68 Degrees F. for winter mode and a programmed set point of 78 Degrees F. for summer mode. When motion is detected in the room the unit(s) will return to normal occupied winter or summer mode
- 22.5 Unoccupied Summer or Winter mode: If an area or zone is in unoccupied mode by time schedule or by the auto/unoccupied switch at the master control panel the units will cycle off. If the building is in winter mode, the fan coil unit will cycle off/on by the room temperature sensor to maintain a night set point of 55 Degrees F. (on at 55 Degrees F. and off at 59 Degrees F.). In unoccupied summer mode the unit will remain off.

**PART 23 – ELECTRIC HEATERS (EH-1 & 2):**

- 23.1 When the outdoor air temperature is 60F (adj.) or below, the heater shall be enabled. The unit is provided with an integral thermostat, control the space temperature to 65°F. TCC to provide a relay to disable the heater when the MCP is indexed to summer mode. The TCC shall provide a wall mounted sensor to allow for monitoring of space temperature and provide low temperature alarm.

**PART 24 – BUILDING RELIEF SYSTEM**

- 24.1 The building relief system consists of (1) rooftop exhaust air fan (EF-2) interlocked to a building pressure sensor installed by the DDC contractor above the ceiling of the 2<sup>nd</sup> floor classrooms.
- 24.2 The fan shall engage from 20% to 100% as required to maintain a positive pressure above the ceiling of 0.5" WG (adj.)



24.3 When the building is indexed to “summer” or “unoccupied”, the system shall be deactivated. The control dampers shall be shut.

24.4 Provide current switch status of exhaust fans.

**PART 25 – AIR HANDLING UNITS AHU-1A and AHU-1B, AHU-2, AHU-3 RELIEF FAN, AND CHILLED/  
HOT WATER COIL (single zone variable air volume unit):**

25.1 General: The air handling unit shall be placed into operation by the DDC system based upon user defined schedule and switch on MCP.

25.2 Supply Air Fan: The supply air fan(s) shall be controlled through a single variable frequency drive (VFD) by with the units. A temperature sensor/humidity located in the space (refer to plans for exact locations), shall control the operation of the supply fan VFD. The supply fan shall vary between the minimum airflow setting and maximum airflow setting to maintain the room temperature setpoint. VFD contacts shall prove fan status. Set the minimum flow per schedule below. When fan status is established control routine shall be enabled. Each fan shall be monitored via a current sensor. Upon motor failure, an alarm shall be sent to the security desk.

- AHU-1A/1B 4,000 cfm
- AHU-2 0 cfm
- AHU-3 1,500 cfm

25.3 Relief Air Fan (EF-4): The relief air fan shall operate when AHU-1A and -1B operates in the economizer mode. The fan shall have a VFD (by this contractor) for modulating airflow. The relief air fan shall track the supply fan speed of each respective unit. Coordinate offset with the T&B contractor. The relief air fan shall not start until outside air damper is 30% open (adj.). VFD contacts shall prove fan status. AHU-2 and AHU-3 do not have a relief air fan.

25.4 Minimum Outdoor Air Flow Control: When the air handling unit is operating in the occupied mode, the outside air and return air shall be at minimum position. When in the occupied mode, the controller shall measure the return air CO2 levels and modulate the outside air dampers open/close on increasing / decreasing CO2 concentrations, overriding normal damper operation to maintain a CO2 setpoint of 1000 ppm (adj.). Provide ability to adjust all parameters of the reset schedule. Provide the option to select a fixed minimum percent of OA. (Refer to the schedule for outside airflow).

25.5 Room Temperature Control: A wall-mounted space temperature sensor located in the space shall control the AHU - 2-way modulating water valve, fan VFD and economizer dampers through a discharge air reset routine. Provide maximum and minimum discharge air setpoints.

25.5.1 When chilled water is available, the 2-way, modulating water control valve shall modulate to maintain 55°F discharge off the coil. The outside air damper shall be at minimum position, return air damper shall be open. The supply fan shall modulate to minimum speed to maintain space temperature setpoint.

25.5.2 When chilled water is unavailable, the outside air damper and return air damper shall modulate as required to maintain room temperature setpoint. Minimum supply air temperature is 55°F. The relief air fan shall be allowed to operate.

25.5.3 When heating is required to maintain space temperature setpoint, the fan shall be at minimum flow, the 2-way modulating water valve shall modulate to maintain space temperature setpoint. The relief air damper shall be closed, relief fan off, the outside air damper shall be at minimum position, return air damper shall be open.

- 25.5.4 When hot water is available, the 2-way, modulating water control valve shall modulate to maintain 110°F discharge off the coil. The outside air damper shall be at minimum position, return air damper shall be open. The supply fan shall modulate to minimum speed to maintain space temperature setpoint
- 25.6 Freeze Protection: The low limit temperature sensor shall be located on the downstream side of the coil. If a temperature of 40 degrees F (adj.), or less is detected, then the outside air and relief air dampers shall fully close and the return air damper shall fully open, hot water valve fully open, relief air fan stop. Upon correction of the problem, the system shall be reset and shall return to normal operation. The freeze protection wire shall be serpentine across the entire face of the water coil every six inches on center. Provide remote indication at the MCP panel.
- 25.7 Smoke Detector: A smoke detector shall be located in the return air stream of each unit as required. If smoke is detected, the supply and relief air fans shall de-activate. Upon correction of the problem, the system shall be reset, and unit shall return to normal operation. Provide remote indication at the MCP panel.
- 25.8 Occupied/Unoccupied Mode: During the unoccupied mode, the supply air fan shall de-activate, relief fan de-activate, outside air damper close, return air damper open. The water valve shall modulate to maintain a 75 degree mixed air plenum temperature. When the space temperature sensor reaches night setback temperature, the unit shall return to operate per the previous sequences. When AHU is operating during the unoccupied mode, the outside air dampers shall remain closed, return damper open and relief fan shall remain off.
- 25.9 Morning Warm-up: When the unit is in morning warm-up mode, then the outside air dampers shall be closed, the return air dampers shall be open, and the relief air dampers shall be closed. Unit is in morning warm-up mode when return air falls below 66° F (adj.) and until return air rises above 69° F (adj.).
- 25.10 Temperature Indication: Provide air temperature indication in the supply and return ducts and entering/leaving air temperature to water coil. Provide water temperature indication for water temperature from coil.

**END OF CONTROL – DIRECT DIGITAL (WEB BASED)**

## **SECTION 26 00 10 - GENERAL REQUIREMENTS FOR ELECTRICAL SYSTEMS**

### **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. The Instructions to Bidders, General and Special Conditions, and all other contract documents shall apply to the Contractor's work as well as to each Sub Contractor's work. Each Contractor is directed to familiarize themselves in detail with all documents pertinent to this Contract. In case of conflict between these General Provisions and the General and/or Special Conditions, the affected Contractor shall contact the Engineer for clarification and final determination.
- C. Each Contractor shall be governed by any alternates, unit prices and Addenda or other contract documents insofar as they may affect their part of the work.

#### 1.2 SUMMARY

- A. Section Includes general requirements applicable to work specified in Divisions 26 and 28.
- B. The work included in this division consists of the furnishing of all labor, equipment, transportation, supplies, material, and appurtenances and performing all operations necessary for the satisfactory installation of complete and operating Electrical Systems indicated on the drawings and/or specified herein.
- C. Any materials, labor, equipment, or services not mentioned specifically herein which may be necessary to complete or perfect any part of the Electrical Systems in a substantial manner, in compliance with the requirements stated, implied, or intended in the drawings and specifications, shall be included as part of this Contract. The Contractor shall give written notice of any materials or apparatus believed inadequate or unsuitable; in violation of laws, ordinances, rules or regulations of authorities having jurisdiction; and any necessary items of work omitted a minimum of ten days prior to bid. In the absence of such written notice and by the act of submitting a bid, it shall be understood that the Contractor has included the cost of all required items in their bid, and that they will be responsible for the approved satisfactory functioning of the entire system without extra compensations.
- D. It is not the intent of this section of the specifications (or the remainder of the contract documents) to make any specific Contractor, other than the Contractor holding the prime contract, responsible to the Owner, Architect and Engineer. All transactions such as submittal of shop drawings, claims for extra costs, requests for equipment or materials substitution, shall be done through the Contractor to the Architect (if applicable), then to the Engineer.
- E. This section of the Specifications or the arrangement of the contract documents shall not be construed as an attempt to arbitrarily assign responsibility for work, material, equipment or services to a particular trade Contractor or Sub-Contractor. Unless stated otherwise, the subdivision and assignment of work under the various sections shall be the responsibility of the Contractor holding the prime contract.

- F. Any reference within these specifications to a specific entity, i.e., "Electrical Contractor" is not to be construed as an provide to limit or define the scope of work for that entity or assign work to a specific trade or contracting entity. Such assignments of responsibility are the responsibility of the Contractor holding the prime contract, unless otherwise provided herein.
- G. In each of the specifications and drawings referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears.
- H. Intent and Interpretation
1. It is the intent of these specifications and all associated drawings that the Contractor provide finished work, tested, and ready for operation. Wherever the word "provide" is used, it shall mean "furnish and install complete, tested and ready for operation."
  2. Minor details not usually shown or specified, but necessary for the proper installation and operation, shall be included in the work, the same as if herein specified or shown.
  3. It is the intention of the Contract Documents to call for a complete and operational system, including all components, accessories, finish work, etc. as necessary for trouble free operation, tested and ready for operation. Anything that may be required, implied, or inferred by the Contract Documents shall be provided and included as part of the Bid.
  4. All Contractors and Vendors providing a bid for this project shall review the Plans and Specifications and determine any modifications and/or adjustments necessary relative to the proposed equipment and materials with specific manufacturer's installation requirements. Include in the bid any necessary installation methods, features, options, accessories, etc. necessary to install the proposed equipment and materials, regardless of whether used as basis of design or being offered as a substitution in accordance with the specific manufacturer's installation requirements whether specifically detailed or not within the Plans and Specifications.
  5. The Bidder/Proposer shall completely review the Contract Documents. Any interpretation as to design intent or scope shall be provided by the Engineer/ Architect. Should an interpretation be required, the Bidder/Proposer shall request a clarification not less than ten days prior to the submission of the proposal so that the condition may be clarified by Addendum. In the event of any conflict, discrepancy, or inconsistency develops, the interpretation of the Engineer shall be final.
  6. The Contractor shall give written notice of any materials or apparatus believed inadequate or unsuitable; in violation of laws, ordinances, rules, or regulations of authorities having jurisdiction; and any necessary items of work omitted a minimum of ten days prior to bid. In the absence of such written notice and by the act of submitting a bid, it shall be understood that the Contractor has included the cost of all required items in the bid, and that will be responsible for the approved satisfactory functioning of the entire system without extra compensations.
- I. Drawings and Specifications
1. The drawings are diagrammatic only and indicate the general arrangement of the systems and are to be followed insofar as possible. If deviations from the layouts are necessitated by field conditions, detailed layouts of the proposed departures shall be submitted in writing to the Engineer for approval before proceeding with the work. The Contract Drawings are not intended to show every vertical or horizontal offset which may be necessary to complete the systems. Contractors shall, however, anticipate that additional offsets may be required and submit their bid accordingly.
  2. The drawings and specifications are intended to supplement each other. No Contractor, bidder, proposer, or supplier shall take advantage of conflict between them, or between parts of either, but should this condition exist, the Contractor or supplier shall request a clarification of the condition at least ten days prior to the submission of bids so that the condition may be clarified by Addendum. In the event that such a condition arises after

- work is started, the interpretation of the Engineer shall be the determining factor. In all instances, unless modified in writing and agreed upon by all parties thereto, the Contract to accomplish the work shall be binding on the affected Contractor.
3. The drawings and specifications shall be considered to be cooperative and complimentary and anything appearing in the specifications which may not be indicated on the drawings or conversely, shall be considered as part of the Contract and must be executed the same as though indicated by both.
  4. This Contractor shall make all their own measurements in the field and shall be responsible for correct fitting. They shall coordinate this work with all other branches of work in such a manner as to cause a minimum of conflict or delay.
  5. The Engineer shall reserve the right to make minor adjustments in location of conduit, fixtures, outlets, switches, etc., where they consider such adjustments desirable in the interest of concealing work or presenting a better appearance.
  6. Each Contractor shall evaluate ceiling heights called for on Architectural Plans and ensure that these heights may be maintained after all mechanical and electrical equipment is installed. Where the location of Electrical equipment may interfere with ceiling heights, the Contractor shall call this to the attention of the Engineer in writing prior to making the installation. Any such changes shall be anticipated and requested sufficiently in advance so as to not cause extra work on the part of the Contractor or unduly delay the work.
  7. Should overlap of work between the various trades become evident, this shall be called to the attention of the Engineer. In such an event, neither trade shall assume that he is to be relieved of the work which is specified under his branch until instructions in writing are received from the Engineer.
  8. The Electrical drawings are intended to show the approximate location of equipment, materials, etc. Dimensions given in figures on the drawings shall take precedence over scaled dimensions and all dimensions whether given in figures or scaled shall be verified in the field. In case of conflict between small- and large-scale drawings, the larger scale drawings shall take precedence.
  9. The Electrical Contractor and their Sub-Contractors shall review all drawings in detail as they may relate to his work (structural, architectural, site survey, mechanical, etc.). Review all drawings for general coordination of work, responsibilities, ceiling clearances, wall penetration points, chase access, fixture elevations, etc. Make any pertinent coordination or apparent conflict comments to the Engineers at least ten days prior to bids, for issuance of clarification by written addendum.
  10. Where on any of the drawings a portion of the work is drawn out and the remainder is indicated in outline, or not indicated at all, the parts drawn out shall apply to all other like portions of the work. Where ornament or other detail is indicated by starting only, such detail shall be continued throughout the courses or parts in which it occurs and shall also apply to all other similar parts of the work, unless otherwise indicated.

### 1.3 COST BREAKDOWN AND PAY APPLICATIONS

- A. Within thirty days after acceptance of the Contract, each Contractor is required to furnish to the Engineer one copy of a detailed cost breakdown on each respective area of work. These cost breakdowns shall be made on forms provided or approved by the Engineer or Architect. Payments will not be made until satisfactory cost breakdowns are submitted. Refer to Division 00 and 01 specification sections for additional requirements.
- B. In addition to cost breakdowns by specification section, the following shall also be provided: Material and labor shall be listed separately. These items are in addition to items listed in Division 01 specifications. Pay special attention to required withholding percentages for startup, testing, documentation, acceptance, owner training, etc. The breakdown shall be minimally as follows:

1. Permitting
2. Mobilization
3. Electrical Submittals
4. Electrical Coordination Drawings
5. Temporary Power
6. Electrical Distribution Equipment Materials & Labor
7. Electrical Distribution Equipment Startup, Testing, & Verification (equal to 2.5% of Equipment Value)
8. Electrical Distribution Equipment Power System Study & Field Adjusting
9. Feeders Materials & Labor
10. Branch Circuiting Materials & Labor
11. Electrical Devices Materials & Labor
12. Cable Trays Materials & Labor
13. Fire Alarm Materials & Labor
14. Fire Alarm System Startup, Testing, & Verification (equal to 5% of Equipment Value)
15. Owner Training
16. Punchlist
17. As-Built/Record Drawings
18. O&M Manuals
19. Warranty
20. Demobilization

#### 1.4 REFERENCES

##### A. Abbreviations and Acronyms

1. A, AMP: Ampere
2. ADA: Americans with Disabilities Act.
3. AFF: Above Finished Floor
4. AFG: Above Finished Grade
5. AHJ: Authority Having Jurisdiction
6. AHU: Air Handling Unit
7. AIC: Amps Interrupting Capacity
8. ANSI: American National Standards Institute.
9. ASA: American Standards Association.
10. ASTM: American Society for Testing Materials.
11. ASHRAE: American Society of Heating, Refrigeration and Air Conditioning Engineers.
12. ATS: Automatic Transfer Switch
13. A/V: Audio/Visual
14. AWG: American Wire Gauge
15. BAS: Building Automation System
16. BFG: Below Finished Grade
17. BICSI: Building Industry Consulting Services International
18. C: Conduit
19. CB: Circuit Breaker
20. CFCI: Contractor Furnished, Contractor Installed
21. CFOI: Contractor Furnished, Owner Installed
22. CKT: Circuit
23. CLG: Ceiling
24. CT: Current Transformer
25. CM: Construction Manager
26. DDC: Direct Digital Building Controls
27. DOAS: Dedicated Outdoor Air System
28. DWG: Drawing

29. EC: Electrical Contractor
30. ELEV: Elevator
31. EM: Emergency
32. EPO: Emergency Power Off
33. FA: Fire Alarm
34. FAA: Fire Alarm Annunciator
35. FACP: Fire Alarm Control Panel
36. FCC: United States Federal Communications Commission
37. FFE: Finished Floor Elevation
38. FLA: Full Load Amps
39. G, GND: Ground
40. GFCI: Ground Fault Circuit Interrupter
41. GC: General Contractor
42. HOA: Hands Off Auto
43. HP: Horsepower
44. IDF: Intermediate Distribution Frame
45. IECC: International Energy Conservation Code
46. ISO: International Standards Organization.
47. IT: Information Technology
48. KVA: Kilovolt-Amperes
49. KW: Kilowatt
50. KWH: Kilowatts Hours
51. LRA: Locked Rotor Amps
52. LTG: Lighting
53. MC: Mechanical Contractor
54. MCA: Minimum Circuit Ampacity
55. MCB: Main Circuit Breaker
56. MDF: Main Distribution Frame
57. MDP: Main Distribution Panel
58. MLO: Main Lugs Only
59. MOCP: Maximum Overcurrent Protection
60. MSB: Main Switchboard
61. N/A: Not Applicable
62. NEC: National Electrical Code
63. NECA: Standards for Installation.
64. NEMA: National Electrical Manufacturers Association.
65. NESC: National Electrical Safety Code.
66. NFPA: National Fire Protection Association.
67. NIC: Not in Contract
68. NRTL: Nationally Recognized Testing Laboratory
69. NTS: Not to Scale
70. N/A: Not Applicable
71. OFCI: Owner Furnished, Contractor Installed
72. OFOI: Owner Furnished, Owner Installed
73. OSHA: Office of Safety and Health Administration.
74. P: Pole, Poles
75. PC: Plumbing Contractor
76. PIR: Passive Infrared
77. RFI: Request for Information
78. RIO: Rough-in Only
79. RM: Room
80. SPD: Surge Protection Device
81. SS: Stainless Steel
82. SWBD: Switchboard
83. TIA: Telecommunications Industry Association

- 84. TYP: Typical
- 85. UL: Underwriters Laboratories, Inc.
- 86. UON or UNO: Unless otherwise noted.
- 87. UG: Underground
- 88. V: Volt, Volts
- 89. VFD: Variable Frequency Drive
- 90. W: Watts
- 91. WG: Wire Guard
- 92. WP: Weather Proof
- 93. XFMR: Transformer

B. Definitions

- 1. Architect: The Architect of Record for the project, if applicable.
- 2. Basis of Design (BOD): Documentation of primary thought processes and assumptions behind design decisions made to meet design intent. Describes systems, components, conditions, and methods chosen to meet intent.
- 3. Bidder/Proposer: Any person, agency or entity submitting a proposal to any person, agency, or entity for any part of the work required under this contract.
- 4. Contract Documents: All documents pertinent to the quality and quantity of work to be performed on this project. Includes, but not limited to: Plans, Specifications, Instructions to Bidders, General and Special Conditions, Addenda, Alternates, Lists of Materials, Lists of Sub-Contractors, Unit Prices, Shop Drawings, Field Orders, Change Orders, Cost Breakdowns, Schedules of Value, Periodical Payment Requests, Construction Manager's Assignments, Architect's Supplemental Instructions, Construction Contract with Owner, etc.
- 5. Contractor: Any Contractor whether bidding, proposing, or working independently or under the supervision of a General Contractor, Prime Contractor, or Construction Manager and who installs any type of Electrical Work as specified in the Contract Documents.
- 6. Electrical Contractor: Any Contractor whether bidding or working independently or under the supervision of the entity holding the Prime Contract and who installs any type of Electrical work, such as: power, lighting, television, telecommunications, data, fiber optic, intercom, fire detection and alarm, security, video, underground or overhead electrical, etc.
- 7. Electrical Sub-Contractor: Each or any Contractor contracted to, or employed by, the Electrical Contractor for any work required by the Electrical Contractor.
- 8. Engineer: The Consulting Mechanical-Electrical Engineer consulting to the Owner, Architect, or Other, etc.
- 9. Indicated: Listed in the Specifications, shown on the Plans or Addenda thereto.
- 10. Install: Install equipment furnished by others in complete working order.
- 11. Installer: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
- 12. Furnish: Deliver to the site in good condition and turn over to the Contractor who is to install.
- 13. Prime Contractor: The Contractor who has been engaged by the Owner in a contractual relationship to accomplish the work.
- 14. Project: All of the work required under this Contract.
- 15. Provide: Furnish and install complete, tested, and ready for operation.
- 16. Start-Up: The activities where systems or equipment are initially tested and operated. Start-up is completed prior to functional testing.
- 17. Typical: Where indicated repeat this work, method or means each time the same or similar condition occurs whether indicated or not.
- 18. Vendor: Supplier of equipment.



- C. Reference Standards: Contractor is responsible for knowledge and application of current versions of all applicable standards and codes. Contractor shall adhere to the most recent revisions or version adopted by the Authorities Having Jurisdiction, including all relevant changes or addenda at the time of installation.
  - 1. IEEE – Institute of Electrical and Electronics Engineers.
    - a. IEEE C2, National Electrical Safety Code
  - 2. NECA – National Electrical Contractors Association.
    - a. NECA 1, Standard for Good Workmanship in Electrical Construction
  - 3. NFPA - National Fire Protection Association.
    - a. NFPA 70, National Electrical Code (NEC)
  - 4. OSHA - The Occupational Safety and Health Act

## 1.5 COORDINATION

### A. Utility Company Requirements

- 1. Contact the utility company for specifics on construction of pads, conduit, etc., prior to bidding the work and determine all their requirements. All work shall be in accordance with their standards.
- 2. Each contractor, prior to bidding the work, is to contact the utility companies (electric and telecommunications) and determine the exact points of extension of all underground services in the field with a representative of each utility company. Also, obtain construction details on manholes, transformer pads, pedestal stub-ups, etc., from each utility company as applicable. Extension points indicated on the plans are approximate and are given for the bidder's information only.
- 3. The Contractor shall provide the local utility company with a drawing produced by a licensed Land Surveyor or a licensed Engineer and acceptable to the utility that locates the centerline of the service and connection point. Coordinate further requirements with utility company.
- 4. The owner is responsible for all fees, permit costs, etc., from the electrical utility, data, telephone, and cable TV companies. This includes any cost associated with the underground electrical service extension.

### B. Coordination with Existing Utilities and Structures

- 1. The locations of all piping, conduits, cables, utilities, and manholes existing, or otherwise, that are present within the contract construction site, shall be subject to continuous uninterrupted maintenance with no exception unless the Owner of the utility grants permission for temporary interruption.
- 2. Known utilities and structures as available to the Engineer are shown on the drawings. However, it is additionally required that, prior to any excavation being performed, each Contractor ascertain and mark all utilities or lines that would be endangered by the excavation. Contractor shall bear costs of repairing damaged utilities.
- 3. If utilities or structures are installed within the construction project boundary, the Contractor shall first probe and make every effort to locate the lines prior to excavating in the respective area.
- 4. Cutting into existing utilities and services shall be done in coordination with and as designated by the Owner of the utility. The Contractor shall work continuously to restore service(s) upon deliberate or accidental interruption, providing premium time and materials as needed without extra claim to the Owner.

5. The Contractor shall repair to the satisfaction of the Engineer any surface or subsurface improvements damaged during the course of the work, unless such improvement is shown to be abandoned or removed.
  6. Machine excavation shall not be permitted within ten feet of existing gas or fuel lines. Hand excavate only in these areas, in accord with utility company, agency or other applicable laws, standards or regulations.
  7. Protect all new or existing lines from damage by traffic, etc. during construction.
  8. Protect existing trees, indicated to remain with fencing or other approved method. Hold all new subsurface lines outside the drip line of trees, offsetting as necessary to protect root structures. Refer to planting or landscaping plans, or in their absence, consult with the Architect.
- C. Interruption of Existing Services: In general, and to the extent possible, perform all work without interruption of the existing facilities' operations. Do not interrupt services to facilities occupied by Owner or others unless permitted under the following conditions:
1. Notify the Owner, Architect, and Engineer no fewer than seven days in advance of proposed interruption of service.
  2. Provide the exact time the interruption will occur and the length of the interruption.
  3. Do not proceed with interruption of service without written permission from Owner, Architect, and Engineer.
  4. Failure to comply with this requirement may result in complete work stoppage by the Contractors involved until a complete schedule of interruptions can be developed.
  5. Contractor will not be entitled to additional compensation due to work stoppage mandated by unscheduled interruption.
  6. Coordinate interruptions with systems impacted by outages including but not limited to the following:
    - a. Generators
    - b. Emergency Lighting
    - c. Elevators
    - d. Fire Alarm Systems
  7. Whenever utilities are interrupted, either deliberately or accidentally, the Contractor shall work continuously to restore the service. The Contractor shall provide tools, materials, skilled journeymen of their own and other trades as necessary, premium time as needed and coordination with all applicable utilities, including payment of utility company charges (if any), all without requests for extra compensation to the Owner, except where otherwise provided for in the contract for the work.
- D. Coordination Between Trades
1. The Contractor is expressly directed to read the General Conditions and all detailed sections of these specifications for all other trades and to study all drawings applicable to their work, including Architectural, Mechanical, Structural and other pertinent Drawings, to the end that complete coordination between trades will be affected.
  2. The Contractor is responsible for the correct location of all rough-in and connections at every piece of equipment. Work not correctly located shall be relocated at the Contractor's expense.
  3. It shall be the responsibility of each Contractor to leave the necessary room for other trades. No extra compensation or time will be allowed to cover the cost of removing fixtures, devices, conduit, ducts, etc. or equipment found encroaching on space required by others.
  4. Where any work is to be installed in close proximity to, or will interfere with work of other trades, each shall cooperate in working out space conditions to make a satisfactory adjustment. If directed by the Engineer, the Contractor shall prepare composite working drawings and sections at a suitable scale not less than  $\frac{1}{4}$  inch = 1 Foot, clearly indicating

how his work is to be installed in relation to the work of other trades, or so as not to cause any interference with work of other trades. The Contractor shall make the necessary changes in his work to correct the condition without extra charge.

5. The Contractor shall furnish to other trades, as required, all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

E. Temporary Services

1. The Contractor shall arrange for temporary electrical and other services required to accomplish the work. In the absence of other provisions in the contract, the Contractor shall provide for temporary services of all types, including the cost of connections, utility company fees, construction, removal, etc., in their bid.
2. All temporary services shall be removed by Contractor prior to acceptance of work.

F. Temporary Use of Equipment

1. The permanent electrical equipment, when installed, may be used for temporary services, subject to an agreement among the Contractors involved, the Owner, and with the consent of the Engineer. Should the permanent systems be used for this purpose, each Contractor shall pay for all temporary connections required and any replacements required due to damage without additional cost to the Owner, leaving the equipment and installation in "as new" condition. The Contractor may be required to bear utility costs, user fees, etc.
2. Permission to use the permanent equipment does not relieve the Contractors who utilize this equipment from the responsibility for any damages to the building construction and/or equipment which might result from its use.

G. Preinstallation Conference

1. Conduct a preinstallation conference at project site before each construction activity when required by other Sections and when required for coordination with other construction.
2. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect and Engineer of scheduled meeting dates.
3. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including any possible conflicts, requirements, limitations, and coordination with other work.
4. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
5. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
6. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

1.6 SUBMITTALS

- A. Review of submittals by the Engineer applies only to conformance with the design intent of the project and general compliance with the information given in the contract documents. In all cases, the installing Contractor alone shall be responsible for furnishing the proper quantity of equipment and/or materials required, for seeing that all equipment fits the available space in a satisfactory manner and that piping, electrical and all other connections are suitably located.

- B. The Engineer's review of submittals, schedules or other required submittal data shall not relieve the Contractor from responsibility for the adaptability of the equipment or materials to the project, compliance with applicable codes, rules, regulations, information that pertains to fabrication and installation, dimensions and quantities, electrical characteristics, and coordination of the work with all other trades involved in this project.
- C. If a submittal deviates from the drawings or specifications because of Contractor's standard practice, approved substitution request, or any other reason, the submittal shall notify the designer of the deviation.
- D. Prior to the start of work the contractor shall submit the following. Work shall not proceed without the Engineer's and Owner's completed review of the submitted items.
- E. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
  - 1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
  - 2. Clearly and precisely mark red notations and yellow highlights on the submittal to show which products and options are applicable.
  - 3. Include the following information, as applicable:
    - a. Manufacturer's catalog cuts.
    - b. Manufacturer's product specifications.
    - c. Standard color charts.
    - d. Statement of compliance with specified referenced standards.
    - e. Testing by recognized testing agency.
    - f. Application of testing agency labels and seals.
    - g. Notation of coordination requirements.
    - h. Rated capacities, operating characteristics, and electrical characteristics,
    - i. Wiring diagrams that show factory-installed wiring and interface points.
    - j. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
  - 4. Format and Organization: submit bookmarked electronic PDF files complying with the following:
    - a. Cover: Clearly display the following information: Owner name, Project name, Submittal name, project submittal number, Contractor name and contact information, and applicable specification section numbers.
    - b. Table of Contents: Include a TOC that lists materials by section number, with a brief product description, manufacturer and part number, and list the submittal page number per product
    - c. Product Information
- F. Product Schedules: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
  - 1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
  - 2. Manufacturer and product name, and model number if applicable.
  - 3. Number and name of room or space.
  - 4. Location within room or space.

- G. Shop Drawings: Prepare Project-specific information, drawn accurately to scale.
1. Shop Drawings that are reproductions of the Contract Documents are not permitted and will be rejected.
  2. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
    - b. Mounting Details
    - c. Wiring diagrams and installation details
    - d. Identification of products.
    - e. Schedules.
    - f. Compliance with specified standards.
    - g. Notation of coordination requirements.
    - h. Notation of dimensions established by field measurement.
    - i. Seal and signature of professional engineer if specified.
- H. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- I. Closeout Submittals
1. Upon substantial completion of the project, provide a minimum of three bound copies with complex index and tabs to locate each item described below along with digital copy in PDF format on USB storage media.
  2. As-Built Record Documentation
    - a. The Contractor shall insure that any deviations from the design are being recorded daily, as necessary, on record drawings being maintained by the Contractor. Dimensions from fixed, visible permanent lines or landmarks shown in vertical and horizontal ways shall be utilized. Compliance shall be a requirement for final payment. Pay particular attention to the location of underfloor or underground exterior in-contract or utility-owned or leased service lines, main switches, and other appurtenances important to the maintenance and safety of the Electrical System. Deliver these record drawings to the Engineer as a system is completed, within ten days of the mark-up and/or while the accuracy of the mark-ups can be verified visually. Monthly payment may be withheld if the requirement is not complied with.
    - b. All underground utilities/piping installed as part of this project shall be surveyed by a land surveyor licensed in the State where the Work is being performed. This shall include underground electrical primary, communications, and structures. The survey shall include actual duct bank depths to top of conduit every 100 feet in length. The survey shall also include benchmarks dimensions relative to above grade, fixed structures. The survey shall be furnished on electronic storage media in AutoCad “.dwg” format and “.pdf” format. The survey information shall be included in the closeout documentation.
    - c. Refer to additional record drawing requirements within the general conditions and other sections of these specifications.
  3. Start-Up and System Testing Certificates
    - a. Provide reports from all required testing to indicate procedures followed and complete results of all tests. Provide reports on manufacturer's standard forms for

- all equipment and system tests. Testing reports shall indicate applicable NEC, NFPA, UL, NETA, and/or ANSI standards.
4. Operation and Maintenance Manuals
    - a. Provide operation and maintenance instructions and parts lists for all equipment provided in this contract. Formatting and content shall follow the guidelines outlined in the latest version of ASHRAE Application Handbook, Guideline.
    - b. All instructions shall be submitted in draft, for approval, prior to final issue. Manufacturer's advertising literature or catalogs will not be acceptable for operating and maintenance instructions.
    - c. The operation and maintenance document directory should provide easy access and be well organized and clearly identified.
    - d. The operation and maintenance manuals shall contain the following information:
      - 1) Emergency information should be immediately available during emergencies and should include emergency and staff and/or agency notification procedures.
      - 2) Provide contacts (company name, address, phone number, email) where parts may be purchased for each principal item of equipment.
      - 3) Provide detailed maintenance instructions, including recommended preventative maintenance schedules for all equipment requiring maintenance. For lighting and lighting controls, provide recommended driver replacement schedule, provide a schedule for inspecting and recalibrating lighting controls, and provide a recommended settings list for all components with adjustable settings.
      - 4) General Information. Provide the following:
        - a) Building function
        - b) Building description
        - c) Operating standards and logs
      - 5) Technical Information. Provide the following:
        - a) System description
        - b) Operating routines and procedures
        - c) Seasonal start-up and shutdown
        - d) Special procedures
        - e) Basic troubleshooting
      - 6) Equipment data sheets. Provide the following:
        - a) Vendor and local representative's contact information
        - b) Operating and nameplate data
        - c) Warranty
        - d) Detailed operating instructions.
        - e) Tools required
        - f) Types of cleaners to use
      - 7) Maintenance program information. Provide the following:
        - a) Manufacturer's installation, operation, and maintenance instructions
        - b) Spare parts information
        - c) Preventive maintenance actions
        - d) Schedule of actions
        - e) Action description
        - f) History
      - 8) Test reports document observed performance during start-up and commissioning.
      - 9) Reference Division 01 specifications for additional requirements.
    - e. Shop drawings will not be accepted as satisfying the requirement for Operation and Maintenance Manuals.
    - f. Submittals: Provide complete copies of all reviewed submittals. Where submittals were returned "Furnish as Corrected", the contractor shall make the corrections

- noted by the engineer and submit final corrected shop drawings with close-out documentation.
- g. Parts List: Provide an inventory of all spare parts, special tools, attic stock, etc. that have been provided to the owner.
  5. Warranty Documentation: Provide all documentation and certificates related to Contractor's warranty and all other specific manufacturer's warranties indicated in the construction documents.
  6. Training Verification: Provide certification that all specified training has been completed. List training session dates, times, and types. Include any session materials and recordings.
  7. Inspection Certificates: Provide certificates of inspection from electrical inspector, fire marshal, and any other required special inspections.
  8. Reports and System Certifications: Provide final reports and any system certifications required in other specification sections.
  9. Power Riser Diagram: Provide a framed and mounted full-size copy of the overall power riser diagram (under glass) to the Owner. Also, provide three vinyl-coated copies of same. Where an existing power riser diagram is present, the Contractor shall obtain the document from the Owner, and update in digital format with the scope of this project. Edits shall be in digital format and this work shall be closely coordinated with the Owner.
  10. Software and Firmware Operational Documentation: Provide documentation, including the following:
    - a. Software operating and upgrade manuals.
    - b. Names, versions, and website addresses for locations of installed software.
    - c. Device address list.
    - d. Printouts of software application and graphic screens.
  11. Software Back-ups: Provide software back-ups on USB media that is clearly and permanently labeled and provided with lanyard to prevent misplacement.

#### 1.7 MAINTENANCE MATERIAL

##### A. Spare Parts and Extra Stock Material

1. Parts and Materials shall be properly marked and packaged for long-term storage.

##### B. Special Tools and Keys:

1. Provide, along with the equipment provided, any special wrenches or tools necessary to dismantle or service equipment or appliances.
2. Wrenches shall include necessary keys, handles and operators for valves, switches, breakers, etc. and keys to electrical panels, emergency generators, alarm pull boxes and panels, etc.
3. Provide at least two of any such special wrench, keys, etc. to the Owner prior to completion of the project. Obtain a receipt that this has been accomplished and forward a copy to the Architect and Engineer.

#### 1.8 QUALITY ASSURANCE

##### A. Manufacturer Qualifications: Manufacturer shall be a firm engaged in the manufacture of specified products of types and sizes required, and whose products have been in satisfactory use in similar service for a minimum of five years unless otherwise approved.

1. The manufacturer shall have a valid ISO 9001 certification and an applicable quality assurance system that is regularly reviewed and audited by a third-party registrar.

Manufacturing, inspection, and testing procedures shall be developed and controlled under the guidelines of the quality assurance system.

2. Equipment shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

B. Installer Qualifications

1. All Electrical Contractors bidding this project must have been a licensed company for a minimum of three years to qualify to bid this project. Individual employee experience does not supersede this requirement.
2. All subcontractors bidding the electrical work must have completed one project of 70 percent this subcontract cost size and two projects of 50 percent this subcontract cost size.
3. All electrical work shall be accomplished by qualified workers competent in the area of work for which they are responsible. Untrained and incompetent workers as evidenced by their workmanship shall be relieved of their responsibilities in those areas. The Engineer shall reserve the right to determine the quality of workmanship of any worker and unqualified or incompetent workers shall refrain from work in areas not satisfactory to them. Requests for relief of a worker shall be made through the normal channels of responsibility established by the Architect or the contract document provisions.
4. All electrical work shall be accomplished by Journeymen electricians under the direct supervision of a licensed Electrician.
5. Special electrical systems, such as Fire Alarm Systems, Telecommunications or Data Systems, Video Systems, Special Electronic Systems, Control Systems, etc., shall be installed by workers normally engaged or employed in these respective trades. Refer to Divisions 28 for additional requirements.

- C. Licensed Professional Engineer Qualifications: Professional Engineer possessing active qualifications in accordance with Division 01 and licensed by the State in which the Work is being performed.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver or install indoor equipment until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above equipment is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.10 FIELD CONDITIONS

A. Ambient Conditions:

1. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
  - a. Ambient Temperature: Not exceeding 104 deg F.
  - b. Altitude: Not exceeding 6600 feet.

1.11 WARRANTIES

- A. Contractor Warranty: Contractor shall unconditionally guarantee all equipment, apparatus, materials, and workmanship entering into this Contract to be the best of its respective kind and



shall replace all parts at their own expense, which fail or are proven defective within one year from Substantial Completion of the work by the Engineer. The effective date of completion of the work shall be the date each or any portion of the work is accepted by the Architect, Engineer, and Owner's Statement of Substantial Completion.

- B. **Manufacturer Warranty:** Items of equipment which have longer guarantees, as called for in these specifications or as otherwise offered by the manufacturer shall have warranties and guarantees completed in order and shall be in effect at the time of final acceptance of the work by the Engineer. The Contractor shall present the Engineer with such warranties and guarantees at the time of final acceptance of the work. The Owner reserves the right to use equipment installed by the Contractor prior to date of final acceptance. Such use of equipment shall in no way invalidate the guarantee except that the Owner shall be liable for any damage to equipment during this period due to negligence of his operator or other employee.
- C. The Warranties specified herein and other Sections shall not deprive the Owner of other rights the Owner may have under provisions of the Contract Documents and shall be in addition to, and run concurrently with other warranties made by the Contractor under requirements of the Contract Documents.

#### 1.12 INDEMNIFICATION

- A. The Contractor shall hold harmless and indemnify the Engineer, employees, officers, agents and consultants from all claims, loss, damage, actions, causes of actions, expense and/or liability resulting from, brought for, or on account of any personal injury or property damage received or sustained by any person, persons, (including third parties), or any property growing out of, occurring, or attributable to any work performed under or related to this contract, resulting in whole or in part from the negligence of the Contractor, any subcontractor, any employee, agent or representative.

#### 1.13 HAZARDOUS MATERIALS

- A. The Contractor is hereby advised that it is possible that asbestos and/or other hazardous materials are or were present in this building(s). Any worker, occupant, visitor, inspector, etc., who encounters any material of whose content they are not certain shall promptly report the existence and location of that material to the Contractor and/or Owner. The Contractor shall, as a part of their work, ensure their workers are aware of this potential and what they are to do in the event of suspicion. The Contractor shall also keep uninformed persons from the premises during construction. Furthermore, the Contractor shall insure that no one comes near to or in contact with any such material or fumes therefrom until its content can be ascertained to be non-hazardous.
- B. CMTA, Inc., Consulting Engineers, have no expertise in the determination of the presence of hazardous materials. Therefore, no attempt has been made by them to identify the existence or location of any such material. Furthermore, CMTA nor any affiliate thereof will neither offer nor make any recommendations relative to the removal, handling, or disposal of such material.
- C. If the work interfaces, connects or relates in any way with or to existing components which contain or bear any hazardous material, asbestos being one, then, it shall be the Contractor's sole responsibility to contact the Owner immediately.
- D. The Contractor by execution of the contract for any work and/or by the accomplishment of any work thereby agrees to bring no claim relative to hazardous materials for negligence, breach of

contract, indemnity, or any other such item against CMTA, its principals, employees, agents, or consultants. Also, the Contractor further agrees to defend, indemnify, and hold CMTA, its principals, employees, agents and consultants, harmless from any such related claims which may be brought by any subcontractors, suppliers or any other third parties.

## **PART 2 - PRODUCTS**

### 2.1 GENERAL REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency suitable to the AHJ, and marked for intended location and application.
- B. Materials used shall present no environmental or toxicological hazards as defined by current industry standards and shall comply with OSHA and EPA standards, other applicable federal, state, and local laws.
- C. Standard Products
  - 1. Except where specifically noted otherwise, all equipment supplied by the Contractor shall be the standard products of a single manufacturer of known reputation and experience in the industry.
  - 2. Only equipment, components, and accessories in current production for at least five years beyond the completion date of this system shall be used and installed. Any equipment found to be obsolete or not in future production will be removed and replaced at Contractor's expense. This includes all equipment, materials, and labor.
  - 3. Products manufactured more than 2 years prior to date of delivery to site shall not be used, unless specified otherwise.
- D. Product numbers are subject to change by the manufacturer without notification. In the event a product number is invalid or conflicts with the written description, notify the Engineer in writing prior to ordering the material and performing installation work.

### 2.2 PRODUCT SUBSTITUTIONS

- A. Conform to the substitutions requirements and procedures outlined in Division 01.
- B. One substitution for each product specified will be considered and substitutions must be submitted to Engineer a minimum of 10 days prior to bid using the standard CSI substitution request form.
- C. If prevailing laws of cities, towns, states, or countries are more stringent than these specifications regarding such substitutions, then those laws shall prevail over these requirements.
- D. Where products are noted as "or equal", a product of equivalent design, manufacture, and performance will be considered. Submit product data (product information, catalog cut sheets, test data, etc.) to substantiate that the product is in fact equivalent to that specified. The burden of proof that the substituted product is equivalent to the specified product rests with the Contractor. Whenever material, process or equipment is specified in accordance with an industry specification (ANSI, TIA, etc.), UL rating, or other association standard, present an affidavit from the manufacturer certifying that the product complies with the particular standard

specification. When requested by the Engineer, submit supporting test data to substantiate compliance.

- E. Manufacturers' names and model numbers used in conjunction with materials, processes or equipment included in the contract documents are used to establish standards of quality, utility and appearance and shall not be construed as limiting competition. Materials, processes, or equipment that, in the opinion of the Engineer, are equivalent in quality, utility and appearance will be approved as substitutions to that specified when "or equal" follows the manufacturers' names or model number(s).
- F. When the Engineer accepts a substitution in writing, it is with the understanding that the Contractor guarantees the substituted product, component, article, or material to be equivalent to the one specified and dimensioned to fit within the construction according to contract documents. Do not provide substituted material, processes, or equipment without written authorization from the Engineer. Assumptions on the acceptability of a proposed substitution, prior to acceptance by the Engineer, are at the sole risk of the Contractor.
- G. Approved substitutions shall not relieve the Contractor of responsibilities for the proper execution of the work, or from provisions of the specifications.
- H. Contractor shall pay expenses, without additional charge to the Owner, in connection with substitution materials, processes and equipment, including the effect of substitution on their work or other Contractor's work.
- I. In all cases where substitutions affect other trades, the Contractor offering such substitutions shall advise all such Contractors of the change and shall reimburse them for all necessary changes in their work. Any Drawings, Specifications, Diagrams, etc., required to describe and coordinate such substitutions or deviations shall be professionally prepared at the responsible Contractor's expense. Review of Shop Drawings by the Engineer does not absolve the Contractor of this responsibility.
- J. Contractor shall be responsible and assume all costs for removal and replacement of any substituted product installed without prior written approval. Such costs shall include, but not be limited to labor, materials as well as any penalties, fees or costs incurred for late completion.

### PART 3 - EXECUTION

#### 3.1 INSTALLERS

- A. Supervision of Work: Each Contractor and Sub-Contractors shall personally supervise the work or have a competent superintendent on the project site at all times during progress of the work, with full authority to act in matters related to the project.
- B. Conduct of Workmen: The Contractor shall be responsible for the conduct of all workmen under their supervision. Misconduct on the part of any workmen to the extent of creating a safety hazard, or endangering the lives and property of others, shall result in the prompt relief of that workman. The consumption or influence of alcoholic beverages, narcotics or illegally used controlled substances on the jobsite is strictly forbidden. Possession of a fire-arm is prohibited and may result in prosecution. Foul or bad language, graffiti is strictly prohibited. Display of nude tattoos is prohibited.
- C. No tobacco use, including smokeless tobacco, is allowed on property.

### 3.2 EXAMINATION

- A. Each Contractor shall inform themselves of all of the conditions under which the work is to be performed, the site of the work, the structure of the ground, the obstacles that may be encountered, the availability and location of necessary facilities and all relevant matters concerning the work. All Contractors shall carefully examine all Drawings and Specifications and inform themselves of the kind and type of materials to be used throughout the project and which may, in any way, affect the execution of their work.
- B. Each Contractor shall fully acquaint themselves with all existing conditions as to ingress and egress, distance of haul from supply points, routes for transportation of materials, facilities and services, availability of temporary or permanent utilities, etc. The Contractor shall include in their work all expenses or disbursements in connection with such matters and conditions. Each Contractor shall verify all work shown on the drawings and conditions at the site and shall report in writing to the Engineer ten days prior to bid, any apparent omissions or discrepancies in order that clarifications may be issued by written addendum. No allowance is to be made for lack of knowledge concerning such conditions after bids are accepted.

### 3.3 PREPARATION

- A. Surveys, Measurements, and Grades
  - 1. The Contractor shall lay out their work and be responsible for all necessary lines, levels, elevations, and measurements. They must verify the figures shown on the drawings before laying out the work and will be held responsible for any error resulting from their failure to do so.
  - 2. Base all measurements, both horizontal and vertical, from established benchmarks. All work shall agree with these established lines and levels. Verify all measurements at site and check the correctness of same as related to the work.
  - 3. Should the Contractor discover any discrepancy between actual measurements and those indicated, which prevents following good practice or the intent of the drawings and specifications, they shall notify the Engineer through normal channels of job communication and shall not proceed with his work until they have received instructions from the Engineer.

### 3.4 INSTALLATION

- A. At no time shall the contractor work on energized electrical equipment. Contractor shall comply with NFPA 70E requirements at all times throughout construction.
- B. Permits and Fees
  - 1. The Contractor shall give all necessary notices, obtain, and pay for all permits, government sales taxes, fees, and other costs in connection with their work. As necessary, the Contractor shall file all required plans, utility easement requests and drawings, survey information on line locations, load calculations, etc., prepare all documents and obtain all necessary approvals of all utility and governmental departments having jurisdiction; obtain all required certificates of inspection for their work and deliver same to the Engineer before request for final acceptance and final payment for the work.
  - 2. Ignorance of Codes, Rules, regulations, utility company requirements, laws, etc., shall not diminish or absolve Contractor's responsibilities to provide and complete all work in compliance with such.

C. Codes and Regulations

1. The Contractor shall include in the work, without extra cost, any labor, materials, services, apparatus, or drawings required in order to comply with all applicable laws, ordinances, rules and regulations, whether or not shown on drawings and/or specified.
2. All materials furnished and all work installed shall comply with the adopted edition of the National Electrical Codes, National Fire Codes of the National Fire Protection Association, the requirements of local utility companies, and with the requirements of all governmental agencies or departments having jurisdiction.
3. All electrical work is to be constructed and installed in accordance with plans and specifications which have been approved in their entirety and/or reflect any changes requested by the AHJ, as applicable or required. Electrical work shall not commence until such plans are in the hands of the Electrical Contractor.
4. The Contractor shall insure their work is accomplished in accord with OSHA Standards and any other applicable government requirements.
5. Where conflict arises between any code and the contract documents, the code shall apply except in the instance where the plans and specifications exceed the requirements of the code. Any changes required as a result of these conflicts shall be brought to the attention of the Engineer at least ten working days prior to bid date, otherwise the Contractor shall make the required changes at their own expense. The provisions of the codes constitute minimum standards for wiring methods, materials, equipment and construction and compliance therewith will be required for all electrical work, except where the drawings and specifications require better materials, equipment, and construction than these minimum standards, in which case the drawings and specifications shall be the minimum standards.

D. Materials and Workmanship

1. All electrical equipment, materials and articles incorporated in the work shall be new and of equal quality to the specified basis of design. All workmanship shall be first-class and shall be performed by electricians skilled and regularly employed in their respective trades.
2. The Contractor shall determine that the equipment he proposes to furnish can be brought into the building(s) and installed within the space available. All equipment shall be installed so that all parts are readily accessible for inspection, maintenance, replacement, etc. Extra compensation will not be allowed for relocation of equipment for accessibility or for dismantling equipment to obtain entrance into the building(s).
3. All fixtures, devices and wiring required shall be installed to make up complete systems as indicated on the drawings and specified herein.
4. All electrical materials, equipment and appliances shall conform to the latest standards of the National Electric Manufacturers Association (NEMA) and the National Board of Fire Underwriters (NBFU) and shall be approved by the Owner's insuring agency if so required.
5. Comply with National Electrical Contractors Association (NECA) performance standards that are published as National Electrical Installation Standards (NEIS).
6. All applicable equipment and devices provided shall meet all FCC requirements and restrictions.

E. Weatherproofing

1. Where any work penetrates waterproofing, including waterproof concrete, the method of installation shall be as approved by the Architect and/or Engineer before work is done. The Contractor shall furnish all necessary sleeves, caulking and flashing required to make openings absolutely watertight.

2. Wherever work penetrates roofing, it shall be done in a manner that will not diminish or void the roofing guarantee or warranty in any way. Coordinate all such work with the roofing installer.

F. Equipment Access

1. The Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate clearance in partitions and above suspended ceilings for the proper installation of their work. Cooperate with the Prime Contractor and all other Contractors whose work is in the same space and advise each Contractor of equipment requirements. Such spaces and clearances shall be kept to the minimum size required to ensure adequate clearance and access.
2. The Contractor shall locate all equipment which must be serviced, operated, or maintained in fully accessible positions. Equipment shall include but not be limited to junction boxes, pull boxes, contactors, panels, disconnects, controllers, switchgear, etc. Minor deviations from drawings may be made to allow for better accessibility, and any change shall be approved where the equipment is concealed.
3. Each Contractor shall provide (or arrange for the provision by other trades) the access panels for each concealed junction box, pull box, fixtures or electrical device requiring access or service as shown on Engineer's plans or as required. Locations of these panels shall be identified in sufficient time to be installed in the normal course of work. All access panels shall be installed in accord with the Architect's standards for such work. In the absence of such specifications, at a minimum such work shall comply with the specifications below. All locations for access panels which are not specifically indicated on the drawings shall be submitted to and approved by the architect prior to ordering.
4. Access Doors; in Ceilings or Walls:
  - a. In mechanical, electrical, and service spaces: 14-gauge aluminum brushed satin finish, 1" border.
  - b. In finished areas: 14-gauge primed steel with 1" border to accept the architectural finishes specified for the space. Confirm these provisions with the Architect prior to obtaining materials or installing any such work.
  - c. In fire or smoke rated partitions, access doors shall be provided that equal or exceed the required rating of the construction they are mounted in.

G. Connections

1. Provide rough-in and final connections to all electrically operated equipment furnished under the Work of the contract documents. Carefully coordinate with equipment suppliers, manufacturer's representatives, vendors, and other trades to provide complete electrical and dimensional interface to all equipment.
2. Provide all power wiring complete from power source to motor or equipment junction box, including power wiring through starters or contactors. Install all starters not factory mounted on equipment.
3. Provide all control, interlock, sensor, thermocouple, and other connections required for equipment operation. Coordinate ampacity and voltage characteristics for all motors and equipment.
4. Prior to bidding the work, coordinate power, control, sensor, interlock and all other wiring requirements for equipment or motors with all other trades, to ensure all needed wiring is provided. Failure to provide such coordination shall not be justification for claims of extra compensation of a time extension to the Contract.
5. At no times shall the contractor work on energized electrical equipment. Comply with NFPA 70E requirements at all times during construction.

- H. Scaffolding, Rigging, and Hoisting: The Contractor shall furnish all scaffolding, rigging, hoisting, and services necessary for erection and delivery into the premises of any equipment and

apparatus furnished. All such temporary appurtenances shall be set up in strict accord with OSHA Standards and Requirements. Remove same from premises when no longer required.

### 3.5 RESTORATION

- A. The Contractor shall replace to their original condition all paving, curbing surfaces, drainage ditches, structures, fences, shrubs, existing or new building surfaces and appurtenances, and any other items damaged or removed by his operations. Replacement and repairs shall be in accordance with good construction practice and shall match materials employed in the original construction of the item to be replaced. All repairs shall be to the satisfaction of the Engineer, and in accord with the Architect's standards for such work, as applicable. Patchwork on new construction will not be accepted.

### 3.6 IDENTIFICATION AND OPERATING INSTRUCTIONS

- A. Provide all equipment with a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.
- B. Provide operating instructions for each system and principal item of equipment as specified in the technical sections for use by operation and maintenance personnel. The operating instructions shall include the following:
  - 1. Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
  - 2. Start up, proper adjustment, operating, lubrication, and shutdown procedures.
  - 3. Safety precautions.
  - 4. The procedure in the event of equipment failure.
  - 5. Other items of instruction as recommended by the manufacturer of each system or item of equipment.
- C. Print or engrave operating instructions and frame under glass or in approved laminated plastic. Post instructions where directed. For operating instructions exposed to the weather, provide weather-resistant materials or weatherproof enclosures. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

### 3.7 SYSTEM TESTING, VERIFICATION, AND START-UP

- A. The Contractor (and Sub-Contractors) shall be responsible for starting-up, testing, checking, examining, inspecting, and verifying their systems.
- B. The Electrical Contractor shall designate an individual under their employment to lead the start-up, testing and verification process. This person should not be the project manager or job site superintendent, but a person dedicated to making this critical task successful and completed in a timely manner.
- C. A pre-start-up conference shall be held with the Architect, Owner, Contractors, and the Manufacturer providing startup services. The purpose of this meeting will be to discuss the goals, procedures, etc. for start-up.
- D. The Contractor shall include in the bid to provide systems startup and verification for all electrical systems specified for this project. Specific startup, testing, and verification

requirements are included throughout the Electrical specifications. In general, as part of the verification process, equipment suppliers shall perform start-up by their factory authorized technicians (unless noted otherwise) and shall complete and submit start-up reports/checklists. Submit start-up reports to the Engineer. The Contractor shall have appropriate trades on site to correct all deficiencies noted by the factory representative. For each deficiency noted, documentation of corrective action (including date and time) shall be submitted to the Engineer and Owner.

- E. Where manufacturer start-up is not specified for a particular piece of equipment or system, the Contractor shall be responsible to perform start-up in strict accordance with manufacturer's instructions.
- F. The Contractor shall be responsible for completion of a System Verification Checklist (SVC) / Manufacturer's Checklists. Furnish to the Testing Agent and Engineer. Sample checklists shall be submitted to the Engineer, Owner, and Testing Agent for approval.
- G. The completed reports shall be organized and bound together in a tabbed binder and submitted for review and approval.

### 3.8 FIELD QUALITY CONTROL

#### A. Inspections

1. Before requesting a final review of the installation from the Architect and/or Engineer, the Contractor shall thoroughly inspect the installation to assure that the work is complete in every detail and that all requirements of the Contract Documents have been fulfilled. Failure to accomplish this may result in charges from the Architect and/or Engineers for unnecessary and undue work on their part.
2. Owner's and Engineer's inspections: Two inspections will be held to generate and then review punchlist items. All site inspections and visits thereafter shall be billed to the Contractor at the Engineer's standard hourly rates.
3. The Contractor shall provide as a part of this contract electrical inspection by a competent Electrical Inspection Agency, licensed to provide such services. The name of this agency shall be included in the list of materials of the Form of Proposal by the Contractor. All costs incidental to the provision of electrical inspections shall be borne by the Electrical Contractor.
4. The Contractor shall advise each Inspection Agency in writing (with an information copy of the correspondence to the Architect and/or Engineer) when they anticipate commencing work. Failure of the Inspection Agency to inspect the work in the stage following and submit the related reports may result in the Contractor's having to expose concealed work not so inspected. Costs associated with any rework, cutting, and patching will be at the expense of the responsible Contractor.
5. Inspections shall be scheduled for rough-in as well as finished work. The rough inspections shall be divided into as many inspections as may be necessary to correct deficiencies. Report of each such inspection visit shall be submitted to the Architect, Engineer, and the Contractor within three days of the inspection.
6. Approval by an Inspector does not relieve the Contractor from the responsibilities of furnishing equipment having a quality of performance equivalent to the requirements set forth in these plans and specifications. All work under this contract is subject to the review of the Architect and/or Engineer, whose decision is binding.
7. Before final acceptance, the Contractor shall furnish three copies of the certificates of final approval by the Electrical Inspector (as well as all other inspection certificates) to the Engineer with one copy of each to the appropriate government agencies, as applicable. Final payment for the work shall be contingent upon completion of this requirement.



B. Punch Lists

1. The Contractor shall review each area and prepare a punch list for each of the subcontractors, as applicable, for at least three stages of the project.
  - a. For review of in-wall work that will be concealed by drywall or other materials well before substantial completion.
  - b. For review of the above-ceiling work that will be concealed by tile or other materials well before substantial completion.
  - c. For review of all other work as the project nears substantial completion.
2. When all work from the Contractor's punch list is complete at each of these stages and prior to completing ceiling installations (or at the final punch list stage), the Contractor shall request that the Engineer develop a punch list. This request is to be made in writing two weeks prior to the proposed date.
3. After all corrections have been made from the Engineer's punch list, the Contractor shall review and initial off on each item. This signed-off punch list shall be submitted to the Engineer. The Engineer shall return to the site once to review each punch list and all work prior to the ceilings being installed and at the final punch list review.
4. At the engineer's option, the contractor shall supply digital photographs via email or file-share of any installed work.
5. If additional visits are required by the Engineer to review work not completed by this review, the Engineer shall be reimbursed directly by the Contractor by check or money order (due 10 days from date of each additional visit) at a rate of \$125.00 per hour for extra trips required to complete either of the above-ceiling or final punch lists.
6. All panelboard fronts shall be removed prior to final punch list inspection and re-installed after completion. Directories for each panelboard shall be completed and available for review by the Engineer at that time.

C. Non-Conforming Work

D. Manufacturer Services

3.9 CLEANING

- A. The Contractor shall, at all times, keep the area of work presentable to the public and clean of rubbish caused by their operations; and at the completion of the work, shall remove all rubbish, all tools, equipment, temporary work and surplus materials, from and about the premises, and shall leave the work clean and ready for use. If the Contractor does not attend to such cleaning immediately upon request, the Engineer may cause cleaning to be done by others and charge the cost of same to the responsible Contractor. Each Contractor shall be responsible for all damage from fire which originates in, or is propagated by, accumulations of rubbish or debris.
- B. After completion of all work and before final acceptance of the work, each Contractor shall thoroughly clean all equipment and materials and shall remove all foreign matter such as grease, dirt, plaster, labels, stickers, etc., from the exterior of materials, equipment, and all associated fabrication. Pay particular attention to finished area surfaces such as lighting fixture lenses, lamps, reflectors, panels, etc.

3.10 TRAINING

- A. Upon completion of all work and all tests, each Contractor shall furnish the necessary skilled labor and helpers for operating all systems and equipment for a period of three days of eight hours each, or as otherwise specified. During this period, instruct the Owner or their

representative fully in the operations, adjustment, and maintenance of all equipment furnished. Give at least one week's written notice to the Owner, Architect and Engineer in advance of this period. The Engineer may attend any such training sessions or operational demonstrations. The Contractor shall certify in writing to the Engineer that such demonstrations have taken place, noting the date, time and names of the Owner's representative that were present.

- B. Training shall be accompanied by complete as-built documentation and the technical systems operation manual.
- C. The training shall be accomplished by a factory trained representative. Include a minimum of Four hours for each system described here-in unless noted otherwise. Each equipment representative shall be represented wherever their equipment is used.
- D. Brochures: Furnish Owner a complete set of operating instructions and diagrams.
- E. Instruction Program: Submit outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
- F. At completion of training, submit two complete training manual(s) for Owner's use.
- G. Qualification Data: For facilitator, instructor, and photographer.
- H. Attendance Record: For each training module, submit list of participants and length of instruction time.

### 3.11 PROTECTION

- A. The Contractor shall be entirely responsible for all material and equipment furnished for their work and special care shall be taken to properly protect all parts thereof from damage during the construction period. Such protection shall be by a means acceptable to the Engineer. Equipment damaged while stored on site either before or after installation shall be repaired or replaced (as determined by the Engineer) by the responsible Contractor. Electrical equipment exposed to the weather shall be replaced by the Contractor at their own expense.

**END OF**

## **SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL SYSTEMS**

### **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 Specification Sections, and Section 260010 "General Requirements for Electrical Systems" apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:

1. Slotted Support Systems.
2. Conduit and Cable Supports.
3. Mounting, Anchoring, and Attachment Components.
4. Fabricated Metal Supports.
5. Concrete Bases.
6. Vibration Isolation pads.
7. Sleeves for penetration of non-fire-rated construction walls and floors.
8. Sleeve-seal systems.
9. Firestopping.
10. Cutting and Patching
11. Painting

#### 1.3 REFERENCES

- A. Abbreviations and Acronyms

1. EMT: Electrical Metallic Tubing.
2. FMC: Flexible Metal Conduit.
3. GRC/GRS: Galvanized Rigid Steel Conduit.
4. LFMC: Liquid-tight flexible metal conduit.
5. RMC: Rigid Metal Conduit

- B. Definitions

1. Channel: A continuous slotted channel (strut) with inturned lips suitable for assembly into multiple configurations

- C. Reference Standards: The following publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest version as of the date of the Contract Documents, unless otherwise specified.

1. Metal Framing Manufacturers Association (MFMA)
  - a. MFMA-4: Metal Framing Standards Publication
  - b. MFMA-103: Guidelines for the use of Metal Framing

#### 1.4 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations with Division 07 Section "Roof Accessories."

#### 1.5 SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of components, profiles, and finishes.
  - 2. Include rated capacities.
- B. Shop Drawings: For fabrication and installation details and include calculations for the following:
  - 1. Slotted channel systems.
  - 2. Equipment supports.
  - 3. Concrete Bases for Equipment.
  - 4. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
- C. Delegated-Design Submittal: Signed and sealed by a qualified professional engineer. For field assembled or fabricated hangers and supports for electrical systems.
  - 1. Include design calculations and details of trapeze hangers.
- D. Qualification Data: For professional engineer.

#### 1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

### **PART 2 - PRODUCTS**

#### 2.1 GENERAL REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency acceptable to the authority having jurisdiction and marked for intended location and application.
- B. Delegated Design: Design support systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

## 2.2 SLOTTED SUPPORT SYSTEMS

- A. Description: Preformed, continuous slot, bolted channels with associated fittings and hardware.
1. Available Manufacturers: Subject to compliance with requirements, provide products from one of the following or an approved equal:
    - a. Eaton B-Line.
    - b. Kindorf.
    - c. nVent Caddy.
    - d. Power-Strut.
    - e. SuperStrut.
    - f. Unistrut.
  2. Comply with MFMA-4 for factory fabricated components suitable for field assembly.
  3. Material and Finish for channel, fittings, and accessories:
    - a. Steel: Minimum 16 gauge, Hot-dip galvanized after fabrication and applied according to ASTM A123 or A153 suitable for indoor or outdoor wet locations.
    - b. Stainless Steel (type 316) per ASTM A276 suitable for corrosive environments.
    - c. Fiberglass: UV-resistant, fire retardant, fiberglass-reinforced polyester resin suitable for corrosive environments.
  4. Channel Dimensions: Minimum 1-5/8 inches wide with varying heights and welded combinations selected to meet applicable load criteria.

## 2.3 CONDUIT AND CABLE SUPPORTS

- A. Available Manufacturers: Subject to compliance with requirements, provide products from one of the following or an approved equal:
1. Eaton B-Line
  2. nVent Caddy
  3. Thomas & Betts
- B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Provide plugs with number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported.
- D. Device Box Mounting Brackets: Factory-fabricated sheet steel brackets for support of device boxes adjacent to or between studs.
- E. Through-Stud Cable and Raceway Support Clips: Factory-fabricated spring steel clip for cables or raceways where run horizontally through metal studs.
- F. Roof-mounted Raceway Support Blocking: Non-penetrating, factory-fabricated support blocking for use under roof-mounted raceways. Wedge-shaped blocking constructed of 100% recycled UV-resistant Rubber with integral galvanized steel strut to accept raceway support clips.
- G. Tee Bar Grid Box Hanger: Factory-fabricated metal electrical box hanger for supporting boxes at locations between ceiling system t-grid components. Height adjustable for various electrical

box depths. Attached to ceiling tee bar with screws or integral clamp for stability. Includes tab for independent support wire attachment.

## 2.4 MOUNTING, ANCHORING, AND ATTACHMENT COMPONENTS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Eaton B-Line
  2. Empire Industries.
  3. Hilti.
  4. ITW.
  5. MKT Fastening.
- B. Description: Items for fastening electrical items or their supports to building surfaces include the following:
1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened Portland cement concrete, or steel with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
  2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated or stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
  3. Concrete Inserts: Steel, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
  4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
  5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
  6. Toggle Bolts: All-steel springhead type.
  7. Hanger Rods: Solid, threaded steel.

## 2.5 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

## 2.6 VIBRATION ISOLATION PADS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Korfund Maxi-Flex Pads or a comparable product by one of the following:
1. Ace Mountings Co.
  2. California Dynamics Corporation.
  3. Eaton B-Line.
  4. Kinetics Noise Control.
  5. Mason Industries.
  6. Vibration Eliminator Co.
  7. VMC Group

- B. Description: Molded, oil resistant, non-skid elastomeric pads arranged in 2-inch square segments.
- C. Size: Factory or field cut to match requirements of supported equipment.
- D. Load Rating from 120 lbs. up to 360 lbs. per 2-inch segment.

## 2.7 SLEEVES

- A. Wall and Floor Sleeves:
  - 1. Galvanized Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.

## 2.8 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable. Link Seal system or approved equal.
  - 1. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
  - 2. Pressure Plates: Glass reinforced nylon polymer.
  - 3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

## 2.9 FIRESTOPPING FOR ELECTRICAL SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products from one of the following or approved equal:
  - 1. Hilti
  - 2. Specified Technologies Inc (STI)
  - 3. Wiremold
- B. Source Limitations: Obtain firestopping systems through one source from a single manufacturer.
- C. General Requirements:
  - 1. Firestopping systems shall bear UL classification marking corresponding to its Fire Resistance Directory.
  - 2. Comply with testing requirements set forth in ASTM E814 or UL 1479.
  - 3. Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
  - 4. Provide components for each through-penetration firestop system that are needed to install fill materials. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.
- D. Fire rated cable pathways: Re-penetrable, maintenance-free cable management devices for use with cable bundles penetrating through fire rated walls or floors.

1. Shall contain a built-in fire sealing system sufficient to maintain the hourly rating of the fire rated wall or floor being penetrated.
  2. The system shall adjust to the installed cable loading and shall permit cables to be installed, removed, or retrofitted without the need to remove or reinstall firestop materials.
  3. Shall be engineered to allow two or more devices to be ganged together with wall plates for larger cable capacities.
- E. Fire-rated cable grommets: Molded, two-piece grommet with sealing membrane for use with single cables or small bundles at through or membrane wall penetrations.
1. System shall be installed around cables and shall lock tightly into the wall assembly.
- F. Outlet Box Putty Pads: Non-hardening, moldable, intumescent material shaped into preformed pads for use with metallic outlet boxes.
- G. Refer to Division 07 for requirements related to other firestopping systems and materials.

### **PART 3 - EXECUTION**

#### 3.1 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation devices for compliance with manufacturer's installation requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Examine substrates and conditions for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 CUTTING AND PATCHING

- A. Unless otherwise indicated, provide cutting and patching necessary to install the work specified. Patching shall match adjacent surfaces to the satisfaction of the Engineer and shall be in accordance with the Architect's standards for such work.
- B. Do not cut structural elements without reinforcing the structure to maintain the designed weight bearing and stiffness. Coordinate approved reinforcement method with Architect and Structural Engineer.
- C. When installing electrical work in insulated concrete form (ICF) walls, provide spray foam insulation to patch the insulated form and maintain the integrity of the insulation value after the work is complete. Work shall not be installed in the concrete center of the wall. All work shall be installed on the interior side of the concrete.



### 3.3 SUPPORT SYSTEM APPLICATION

- A. Comply with NFPA 70, NECA 1, NECA 101, and MFMA-103 for application of hangers and supports for electrical equipment and systems except where requirements of this Section are more stringent.
- B. Maximum Horizontal and Vertical Support Spacing for Raceway(s): Space supports for raceways as required by NFPA 70.
- C. Minimum Hanger Rod Size for Raceway Supports: 3/8-inch diameter unless noted otherwise.
- D. Single Raceways:
  - 1. For Raceways 1-1/4-inch and smaller: Install adjustable steel band hanger suspended on threaded rod.
  - 2. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/4-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.
- E. Multiple Raceways and single raceways larger than 1-1/4-inch:
  - 1. Install trapeze-type supports fabricated with slotted support system suspended on threaded rods for horizontal applications and fastened to building structure for vertical applications.
  - 2. Size so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
  - 3. Secure raceways and cables to these supports with two-bolt steel conduit clamps or single-bolt steel conduit clamps using spring friction action for retention in support channel.

### 3.4 SUPPORT SYSTEM INSTALLATION

- A. Comply with NFPA 70, NECA 1, NECA 101, and MFMA-103 for installation requirements except where requirements of this Article are more stringent.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components multiplied by a safety factor of four with a minimum of 200 lbs.
- C. Mounting and Anchorage of Surface-Mounted or Recessed-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
  - 1. To Wood: Fasten with lag screws or through bolts.
  - 2. To New Concrete: Bolt to concrete inserts.
    - a. Where support anchors are required, establish their type and locate in concrete construction before concrete is poured. Fit each hanger rod with a nut at its upper end, and set nut in a universal concrete insert in the form. Where supported weight exceeds holding strength of a single insert, pass rods through top slot of inserts and interlock with reinforcing steel. Also, where particularly heavy loads are to be supported, suspend hanger rod or rods from a structural angle spanning two or more inserts and securely bolted thereto to distribute the weight.
  - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.

4. To Existing Concrete: Self-drilling concrete anchors or expansion anchor fasteners.
  5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69 or Spring-tension clamps.
  6. To Light Steel: Sheet metal screws.
  7. For Surface-Mounted Items on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to structure. Attachment to gypsum wall board is not acceptable as sole support means; slotted-channel rack solidly attached to structure or light-gauge metal framing at both ends is required.
  8. For Recessed-Mounted Items in Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices to intermediate light-gauge metal framing members on each side of device or provide slotted-channel racks within hollow wall attached to structure by means that meet anchorage requirements. Attachment to gypsum wall board is not acceptable as sole support means.
- D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars or existing raceways embedded in slab. Verify reinforcing locations with Structural Engineer and X-Ray existing concrete structures as required.
- E. Do not support any items (equipment, piping, conduit, etc.) exceeding 2 inches in diameter from the bottom of slabs. Where intermediate supports are required between structural members, use slotted steel channels support systems attached to beams or joists in order to avoid attachment to slabs.
- F. Slotted Support Systems
1. Install slotted channel systems level and plumb.
  2. Remove burrs from all exposed cut edges prior to installation.
- G. Wall Stud and Ceiling Supports
1. Fasten junction, pull and devices boxes securely to the building construction, independent of raceway system.
  2. Install Device Box Mounting Brackets supported between two studs. Attach all device boxes to two studs, device box stabilizers are prohibited.
  3. Install Tee Bar Grid Box Hanger supported between two ceiling grid tee bars where devices boxes are located flush in recessed suspended ceilings. Install at least one independent support rod from box hanger to structure.
  4. Install Through-Stud Cable and Raceway Support Clips where cables or raceways run horizontally through metal studs.
- H. Install Roof-mounted Raceway Support Blocking where raceways run on across roofing.
1. Coordinate installation of roof supports with items specified in Division 07 Section "Roof Accessories." Provide products compatible with rooftop materials included in the Work to maintain warranty of roof system.
- I. Threaded Rod Hardware
1. Provide minimum of two lock nuts per threaded support rod except where lock nut tightens against a threaded socket, one locknut may be used.
  2. Trim rod excess to within 1-inch of locknut, de-burr, and provide protective endcap.

- J. Support raceways at a distance above suspended ceilings to permit removal of ceiling panels and luminaires.
- K. Locate raceways and supports so as not to hinder function or code required clearance to any system or equipment.
- L. Provide independent supports and hang all electrical raceways and devices from the building structure with UL listed and approved materials. Utilizing the support systems of other trade's work is prohibited, except with written approval from the Engineer.
- M. Provide riser support clamps for vertical conduit runs and install at each floor level penetration and at additional locations required to support weight of system.
- N. Tighten all bolted connections to proper torque values in accordance with manufacturer's written instructions.
- O. Provide supports to maintain 1/4-inch air space between raceway and mounting surface where raceways are mounted exposed in wet or corrosive locations and where directly attached to concrete or masonry.
- P. The use of tie wire or perforated metal tape for support or fastening of any raceway system is prohibited.
- Q. Where galvanized wire is used for cable supports above suspended ceilings, provide minimum #12 support wire independent of ceiling system secured at both ends. Paint or provide tag to distinguish supports from ceiling system.
- R. Welding directly on raceways, fittings, or outlet boxes is prohibited.

### 3.5 INSTALLATION OF VIBRATION ISOLATION PADS

- A. Select vibration device load ratings to match equipment loading and deflection criteria.
- B. Arrange pads in single or multiple layers of sufficient stiffness for uniform loading.
- C. Install pre-cut segments in accordance with manufacturer recommendations to match shape of equipment base.

### 3.6 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

### 3.7 CONCRETE EQUIPMENT BASES

- A. Housekeeping Pads: Construct concrete housekeeping pads a minimum of 4-inches thick and 6-inches larger in both directions than supported unit.
- B. Exterior Equipment Pads: Construct exterior equipment pads a minimum of 8-inches thick and 6-inches larger in both directions than supported unit unless noted otherwise.
- C. Use 4000-psi, 28-day compressive-strength concrete unless otherwise noted. Comply with Division 03 Section "Cast-in-Place Concrete" and ACI standards for subbase requirements, concrete materials, reinforcement, placement, and cover requirements.
  - 1. Reinforce pads with a minimum #4 rebar on 12-inch centers each way or equivalent welded wire fabric. Support reinforcement and tie together to prevent displacement during construction.
  - 2. For interior pads, provide #4 dowels at 24-inch centers each way (minimum of 4) to anchor to structural slab below. Embed dowels into slab a minimum of 3-inches.
  - 3. Provide rubbed finish for all surfaces.
  - 4. Provide 3/4-inch chamfer at all exposed edges.
  - 5. Provide Engineer approved repairs if pad surface is rough or shows signs of honeycomb.
  - 6. Provide crown for exterior pads with a slope of 1/8-inch per foot.
  - 7. Do not set heavy equipment on pad for at least 7 days after pour unless approved by Engineer.
- D. Anchor equipment to concrete base.
  - 1. Locate anchors to be a minimum of 10 bolt diameters from edge of the base.
  - 2. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 3. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 4. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

### 3.8 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Coordinate all required openings and provide sleeves and inserts prior to construction of wall and floor systems. Where openings are missed or incorrectly located, provide core-drilling and patching at no additional expense to owner.
- C. Install sleeves without compromising structural integrity of wall or floor.
- D. Sleeves for Conduits or Cable Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
  - 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
    - a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint.
    - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
  - 2. Unless sleeve seal systems are used, size pipe sleeves to provide a minimum 1/4-inch annular clear space between sleeve and raceway. Where conduit motion due to

- expansion and contraction will occur, provide sleeves a minimum of two conduit sizes larger than the nominal conduit diameter.
3. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls.
    - a. For conduit penetrations, cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
    - b. For cable penetrations, extend sleeve a minimum of 2-inches beyond surface of wall and provide plastic insulated bushing.
  4. Install sleeves for floor penetrations. Extend sleeves installed in floors a minimum of 6-inches above finished floor level unless noted otherwise. Install sleeves during erection of floors.
  5. Fasten sleeves securely in floors, walls, so that they will not become displaced when concrete is poured or when other construction occurs around them. Take precautions to prevent concrete, plaster or other materials being forced into the space between pipe and sleeve during construction.
- E. Sleeves for Cables Penetrating Non-Fire-Rated Gypsum Board Assemblies:
1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
  2. Seal space outside of sleeves with approved joint compound or acoustical sealant for gypsum board assemblies.
- F. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units and counter flashing applied in coordination with roofing work. Coordinate all work with roofing system to maintain roof warranty.
- G. Exterior-Wall and Floor Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seal system. Size sleeves to allow for manufacturer recommended annular clear space between raceway or cable and sleeve for installing sleeve-seal system. Where sleeves are installed in core drilled openings, grout sleeve into the opening.
- H. Where sleeves are installed exposed in finished spaces, provide metal escutcheon plates of size to match the sleeve.
- I. Sleeve-Seal-System:
1. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
  2. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- 3.9 ELECTRICAL SYSTEM FIRESTOPPING INSTALLATION
- A. Install firestopping at all penetrations of fire-rated assemblies. Comply with requirements in Division 07 and as outlined below.
  - B. Coordinate location and proper selection of firestop devices with fire rated assembly. Ensure cast-in place devices are installed before placement of concrete.

- C. Install firestop materials in accordance with UL Fire Resistance Directory and manufacturer's instructions.
- D. Affix permanent label to each side of penetration immediately adjacent to firestopping to communicate to futures installers and code authorities the following:
  - 1. Fire-stop product/system used
  - 2. Installation Company
  - 3. Penetration Hour Rating
  - 4. Installation Date
- E. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas. Keep areas of work accessible until inspection by applicable code authorities.

### 3.10 PAINTING

- A. Touchup: Comply with requirements in Division 09 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

## **END OF COMMON WORK RESULTS FOR ELECTRICAL SYSTEMS**

## **SECTION 26 05 05 - SELECTIVE DEMOLITION FOR ELECTRICAL**

### **PART 1 - GENERAL**

#### 1.1 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 Specification Sections, and Section 260010 "General Requirements for Electrical Systems" apply to this Section.

#### 1.2 SUMMARY

- A. This section covers all demolition, restoration, and salvage required to perform the electrical work indicated on the drawings, specified and/or as required to complete the project. It is the intent of this section of work to remove all existing electrical equipment, materials, etc. which are not required for the completed building and to restore any and all finished surfaces to their original type and conditions. To accomplish these requirements, the Contractor(s) shall, at his own expense, engage the services of others already performing finish work on this project. All work shall be completed to the satisfaction of the Architect/Engineers whose decisions shall be final. This requirement shall apply to all restoration work whether indicated or specified.

#### 1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and re-installed.
- B. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, clean and prepare for reuse, and reinstall where indicated.
- C. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed or salvaged, or removed and reinstalled.
- D. Demolish: Completely remove and legally dispose of off-site.
- E. Recycle: Recovery of demolition waste for subsequent processing in preparation for reuse.
- F. Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner. Include fasteners or brackets needed for reattachment elsewhere.

#### 1.4 SUBMITTALS

- A. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.
- B. Pre-demolition Photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by selective electrical demolition operations. Submit before the Work begins.

1.5 MATERIALS OWNERSHIP

- A. Except for items or materials to be reused, salvaged, reinstalled or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option but in compliance with ordinances and regulations related to the materials being disposed.

1.6 PROJECT CONDITIONS

- A. Building will be occupied during construction. Localized areas to be demolished will be vacated during demolition work. Conduct selective electrical demolition so Owner's operations will not be disrupted.
- B. Corridors immediately adjacent to the demolition areas will be occupied. Conduct demolition so that access to and between occupied areas will be maintained.
- C. On-site storage or sale of removed items or materials is not permitted.

1.7 COORDINATION

- A. Demolition schedule shall not interfere with Owner's on-site operations and operations of adjacent occupied buildings.
- B. Prior to beginning demolition, arrange a conference with the Construction Representative to review electrical demolition scope, procedures, schedule, and items to be salvaged for the Owner.
- C. Review requirements of General Demolition Contractor and work performed by other trades that rely on demolition of electrical circuitry or equipment to allow for structural demolition or removal of equipment.
- D. Review areas where existing electrical circuitry and/or equipment is to remain in place and requires protection.

1.8 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with governing EPA notifications regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

**PART 2 - PRODUCTS**

- A. NOT USED



### **PART 3 - EXECUTION**

#### 3.1 EXAMINATION AND RECORDING OF EXISTING CONDITIONS

- A. Contractor is responsible for submitting photos and documenting existing conditions to Owner prior to commencing demolition. Systems and equipment found to be defective after demolition has commenced shall be repaired or replaced by Contractor at no additional cost to Owner.
- B. Notify Construction Representative of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged. Use photographs to document conditions.

#### 3.2 PROTECTION

- A. Comply with governing laws, codes, and regulations governing fire protection and environmental protection during electrical demolition operations.
- B. Existing Utilities: maintain existing utilities and building services and protect from damage during demolition operations.
  - 1. All adjacent areas need to remain in operation and services to other areas outside area of construction need to be maintained during demolition.
  - 2. Disconnect electrical power and communications only to the items of equipment or the panelboard that is identified for removal under the selective electrical demolition scope.
  - 3. Provide temporary services during interruptions to existing utilities or building services as acceptable to Owner and Authorities Having Jurisdiction.
- C. Protect lighting fixtures, exit signs, fire alarm devices, communications devices, etc. that are to remain in place from damage during demolition and construction operations. Exposed fixtures and devices shall have a plastic bag or other suitable covering affixed over the item to protect from dust and paint splatters.
- D. Provide and maintain temporary partitions, dust control barrier, and ventilation per owner's dust control plan.
- E. Temporary enclosures and protection shall be removed by the Contractor upon completion of the electrical demolition work unless otherwise directed by the Construction Representative.

#### 3.3 GENERAL REQUIREMENTS

- A. Demolish and remove existing construction in the area of work to the extent required by new construction unless noted otherwise.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.
- C. Where electrical fixtures, equipment or other materials are removed and/or relocated, all abandoned conduit and conductors shall be removed in exposed areas. In concealed areas,

materials shall be labeled and abandoned in place or removed as indicated and patch all openings.

- D. The Contractor shall be responsible for the removal and/or relocation of any electrical equipment, fixtures, devices, appurtenances, etc. which may, in the course of construction, interfere with the installation of any new and/or relocated Architectural, Mechanical, Electrical, Structural or Fire Protection Systems whether indicated or not.
- E. Where components of any system in this contractor's scope of work are to be reused, the contractor shall test those components prior to removal and record the state of functionality and condition of the components as tested. These records shall be provided to the owner or engineer upon request. In the absence of these records, all components removed shall be assumed functional at the time of removal. Any device subsequently found to be non-functioning or in unsuitable condition for reuse shall be replaced at the expense of the contractor.
- F. At concealed spaces, such as hollow walls, ducts, and pipe interiors, verify condition and contents of hidden space before starting electrical demolition operations.
- G. All hanger and support material for demolished piping and conduit shall be removed back to the primary structural support member. Grind connection to primary member smooth and touch up with paint to match adjacent surface.
- H. Conduit containing circuits which are to be retained shall remain in place, unless otherwise indicated or required.
- I. Wiring for existing circuits which must be rerouted, or which are partially abandoned, shall be reconnected to service the outlets/loads remaining on the circuit.
- J. All wiring for a circuit which is to be removed or abandoned shall be removed back to the panel which supplied the circuit.
- K. All open conduit knockouts, holes or unused hubs in electrical boxes and enclosures shall be properly plugged with suitable blanking devices that maintain the NEMA rating of the box or enclosure.

### 3.4 PATCHING AND REPAIRS

- A. Unless otherwise indicated, the Contractor shall be responsible for the patching and repairing of all holes, etc. in the ceiling, wall and floors where electrical equipment is removed.
- B. All damages to buildings, utilities, and services to remain in place shall be promptly repaired at no cost to the Owner.
- C. Where an existing utility or building service is interrupted, the contractor shall work continuously, providing premium time, to repair and restore service.
- D. Neatly cut openings and holes plumb, square and true to dimensions, required.
- E. Demolish concrete and masonry in small sections, cutting at junctures with construction to remain.

- F. Use cutting methods least likely to damage construction to remain or adjoining construction. To minimize disturbance of adjacent surfaces, use hand or small power tools designed for sawing or grinding, not hammering, and chopping. Temporarily cover openings to remain.
- G. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
- H. All holes or openings in floors, walls or ceilings resulting from electrical demolition shall be properly sealed with material similar to the adjacent surface/finish.
  - 1. Patch holes in concrete floors and ceilings where conduits are removed using non-shrink epoxy grout or concrete material to match existing surfaces and construction.
  - 2. Patch holes in walls and partitions where conduits are removed to match existing construction and finish.
- I. All rough edges of openings created by electrical demolition shall be promptly patched to create a finished surface.
- J. Maintain the fire rating of all floors, walls, partitions, and ceilings when patching.

### 3.5 SALVAGED ITEMS

- A. Items noted to be salvaged shall be cleaned, packed, or crated with contents identified on the container. The items shall be stored in a secure area until delivery to Owner. Transport items to storage area designated by Owner. Protect items from damage during transport and storage.

### 3.6 RE-INSTALLED ITEMS

- A. Items noted to be removed and re-installed shall be carefully removed, cleaned, and repaired to functional condition adequate for intended reuse.
- B. Pack or crate items after cleaning and repairing with contents identified on the container. Store and protect items from damage.
- C. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment.
- D. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

### 3.7 EXISTING ITEMS TO REMAIN

- A. Protect construction indicated to remain against damage and soiling during selective electrical demolition.
- B. When permitted by Construction Representative, items may be removed to a suitable, protected storage location during selective electrical demolition and reinstalled in their original locations after selective electrical demolition operations are complete.

3.8 DISPOSAL

- A. Transport demolished materials off Owner's property and dispose of legally in accordance with Federal, State, and local laws and regulations.
- B. Lamps: Legally dispose of lamps in accordance with EPA guidelines.
  - 1. Contractor shall be responsible for the careful removal of all lamps and fluorescent tubes without breakage from existing lighting fixtures.
  - 2. Lamps removed from fluorescent, metal halide, mercury vapor, and sodium fixtures that do not have green end caps shall be placed by the Contractor in cardboard boxes. The Contractor shall label each box with type and quantity of lamps in each box and seal the box. Boxes shall be properly disposed of.
  - 3. Broken, fluorescent, metal halide, mercury vapor, and sodium lamps without green end caps shall be immediately and carefully cleaned up by the Contractor, placed in a 55 gallon steel drum and properly disposed of by the Contractor

3.9 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.

**END OF SELECTIVE DEMOLITION FOR ELECTRICAL**

## **SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

### **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions, Division 01 Specification Sections, and Section 260010 "General Requirements for Electrical Systems" apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Building wire and cable rated 600 V and less.
  - 2. Connectors, splices, and terminations rated 600 V and less.
  - 3. Control Voltage Conductors and Cables
- B. Related Requirements:
  - 1. Refer to Division 27 for requirements related to balanced unshielded twisted pair (UTP) cabling.

#### 1.3 REFERENCES

- A. Abbreviations
  - 1. RoHS: Restriction of Hazardous Substances.
- B. Definitions
  - 1. Low Voltage: Circuits and equipment operating at more than 50VAC but less than 1000VAC for building electrical distribution systems.
  - 2. Control Voltage: Circuits and equipment operating at less than 50VAC for remote-control and signaling power-limited circuits.
  - 3. Plenum: A space forming part of the air distribution system to which one or more air ducts are connected. An air duct is a passageway, other than a plenum, for transporting air to or from heating, ventilating, or air-conditioning equipment.
  - 4. Homerun: The run of raceway(s) and cable(s) between the panelboard or switchboard and the junction box in the area served where branch circuit cables originate.
- C. Reference Standards: The following publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest version as of the date of the Contract Documents, unless otherwise specified.
  - 1. National Electrical Contractors Association (NECA)
    - a. NECA 104, "Installing Aluminum Building Wire and Cable"
    - b. NECA/NACMA 120, "Standard for Installing Armored Cable (Type AC) and Type Metal-Clad (MC) Cable"

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Schedule: Indicate type, use, and location.

**PART 2 - PRODUCTS**

2.1 GENERAL REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

2.2 BUILDING WIRE AND CABLE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Alpha Wire Company.
  - 2. Cerro Wire LLC.
  - 3. Encore Wire Corporation.
  - 4. General Cable Technologies Corporation.
  - 5. Okonite Company.
  - 6. Southwire Company.
- B. Building Wire Description: Flexible, insulated, and uninsulated, drawn current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- C. Cable Description: A factory assembly of one or more current-carrying insulated conductors in an overall protective sheath.
- D. General Requirements:
  - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
  - 2. RoHS compliant.
  - 3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- E. Copper Conductors: 98% conductive annealed copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
- F. Conductor Insulation:
  - 1. 600V, 90°C
  - 2. Comply with ANSI/NEMA WC 70/ICEA S-95-658.
  - 3. THHN/THWN-2: Comply with UL 83.
  - 4. XHHW-2: Comply with UL 44.
  - 5. RHW-2: Comply with UL 44 and UL 2196.

- G. Mineral Insulated Cable, Type MI
  - 1. Solid copper conductors encased in compressed metal oxide with an outer metallic sheath
  - 2. UL 2196 for fire resistance.
  - 3. Insulation: Compressed magnesium oxide
  - 4. Sheath: Copper

## 2.3 SPLICING DEVICES & CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. 3M; Electrical Products Division.
  - 2. AFC Cable Systems, Inc.
  - 3. Burndy
  - 4. Gardner Bender.
  - 5. Hubbell Power Systems, Inc.
  - 6. Ideal Industries, Inc.
  - 7. ILSCO.
  - 8. NSi Industries LLC.
  - 9. O-Z/Gedney;
  - 10. Thomas & Betts.
  - 11. Tyco Electronics Corp.
- B. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- C. Material: Tin plated copper
- D. Twist-On Wire Connectors: spring pressure type, 600V, 105°C insulation, capable of connecting two or more wires up to #8 AWG in a pigtail application.
- E. Crimp Sleeve Splices: butt or parallel crimp type, copper sleeve with nylon cover and skirted insulators, capable of permanent connection of two or more wires up to #10 AWG.
- F. Compression Splices: standard or long barrel type, 90°C, with cold shrink tubing, for use with hydraulic crimping tool, capable of permanent connection of wires #6 AWG and larger.
- G. Ring or Flanged Fork Tongue Terminals: crimp type, 600V, 105°C insulation, insulated serrated barrel, capable of terminating wires up to #10 AWG.
- H. No aluminum splicing devices or connectors are permitted.

## 2.4 CONTROL VOLTAGE CONDUCTORS AND CABLE

- A. Control Cable: NFPA 70, Type CMG or CMP
  - 1. Single or Multi-pair, twisted, minimum No. 18 AWG, stranded tinned copper conductors.
  - 2. PVC insulation.
  - 3. Shielded or Unshielded.
  - 4. Flame Resistance:
    - a. CMG: Comply with UL1685

- b. CMP: Comply with NFPA 262
- B. Class 1, 2, and 3 Control Circuits: Stranded Copper, Type THHN/THWN-2

### **PART 3 - EXECUTION**

#### 3.1 CONDUCTOR AND INSULATION APPLICATION

- A. Feeders and Branch Circuits: Copper. THHN/THWN-2. Solid for #10 AWG and smaller; stranded for # 8 AWG and larger.
  - 1. Provide XHHW-2 insulation for the following:
    - a. Circuits routed exposed on rooftops.
    - b. Conductors on the load side of a Variable Frequency Drive.
  - 2. Provide RHW-2 fire resistive cable in raceway for emergency system feeders located above ceilings and not protected by an automatic fire suppression system.
- B. Conductors for motors or vibrating or oscillating equipment: Extra flexible stranded.
- C. Cord Drops and Portable Appliance Connections: Type SOOW, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
- D. Conductor sizes indicated on drawings are based upon 75 degree C rating.
- E. Minimum branch circuit or feeder size:
  - 1. Not less than #12 AWG copper wire unless noted otherwise.
- F. Minimum control circuit conductor sizes:
  - 1. Class 1 remote-control and signal circuits; No 14 AWG.
  - 2. Class 2 low-energy, remote-control, and signal circuits; No. 16 AWG.
  - 3. Class 3 low-energy, remote-control, alarm, and signal circuits; No 12 AWG
- G. Provide all wire for the project in new and undamaged condition. Deliver in standard coils or reels. Wires and cables manufactured more than 24 months prior to date of delivery to the site are not acceptable.

#### 3.2 EXAMINATION

- A. Prior to installing conductors and cables:
  - 1. Verify that raceway installation is complete according to Section 260533 "Raceways and Boxes for Electrical Systems" and ready for installation of conductors and cables.
  - 2. Verify that raceways are properly sized in accordance with NEC.
  - 3. Visually inspect exposed raceways to ensure that raceways are not damaged and bends are not deformed.
  - 4. Verify that raceways do not exceed the maximum number of bends between pull-points.
  - 5. Verify raceways have been cleaned of all dirt and debris.

#### 3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Pulling Conductors in Raceways



1. Pull cables in accordance with cable manufacturer and pulling equipment manufacturer recommendations as well as applicable sections of the National Electric Code.
  2. Use installation equipment, tools, and materials as necessary, such as sheaves, pulling eyes, basket grips, winches, cable reels and/or cable reel jacks, duct entrance funnels, and pulling tension gauges, and approved pulling lubricants where required to facilitate cable pulling without damage to cables or raceway.
  3. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not use lubricants that harden or become adhesive with age. Apply lubricant where cables enter ducts and conduits and at all intermediate access points on long or difficult pulls.
  4. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values. Utilize special remote readout equipment to ensure compliance.
  5. Avoid abrasion and other damage to cables during installation. Provide physical protection of cables, such as using appropriately sized flexible cable guides or feed-in tubes, at the entrance of boxes and raceways.
  6. If basket-grip type cable-pulling devices are used to pull cable in place, cut off the section of cable under the grip before splicing and terminating.
- B. Bend Radius
1. Handle conductors and cables carefully. Make bends in cables and conductors such that cables, conductors, sheaths, armor, etc., are not damaged.
  2. Do not bend conductors and cables to less than the NEC and manufacturer recommended minimum bending radius.
  3. Ensure that tools and accessories used to install conductors and cables, such as rollers, sheaves, trolley assemblies, tube guides, and/or raceways, are properly sized and utilized to be greater than the minimum bending radii of conductors and cables.
  4. Minimize bending where conductors and cables enter or exit raceways, cabinets, and boxes. Do not install cables that have been bent or kinked to a radius less than the recommended dimension.
  5. Install conductors only after insulating bushings are in place.
- C. If multiple circuits are pulled in a single homerun, provide a dedicated neutral for each phase conductor. In these cases, a maximum of seven conductors (six current carrying and one ground) are permitted in a single conduit except for switch legs and travelers in multi-point switching arrangements. De-rate conductors per NEC.
- D. Multi-wire branch circuits with a shared neutral are not permitted unless specifically noted on the drawings. Where indicated, group the phases and neutral together with cable ties in the panelboard and in all pull boxes.
- E. Install conductors for isolated power systems in as short a run of conduit as practicable. The use of pulling compound or lubricant is not permitted on conductors in isolated power systems.
- F. Voltage Drop:
1. Adjust conductors and conduit sizes accordingly based on actual field installed conditions.
  2. Size and Install all feeders and branch circuits for a maximum 2% voltage drop in feeders and 3% in branch circuits with a maximum total voltage drop of 5%.
  3. Calculate using a load equal to 80% of the supply breaker rating unless the circuit breaker is rated to carry 100% of the load.
  4. Where the conductor length from the panel to the first outlet on a circuit exceeds the values below, adjust branch circuit conductors from the panel to the first outlet. Increase the conductor size of remaining branch circuit as needed to meet above voltage drop limitations.

- a. For 277VAC homeruns exceeding 125-feet, #10 AWG minimum
  - b. For 120VAC homeruns exceeding 50-feet, #10 AWG minimum
  - c. For 120VAC homeruns exceeding 100-feet, #8 AWG minimum
- G. Aluminum Conductors
1. The use of aluminum conductors is not permitted.
  2. Provide terminations according to NECA 104 and manufacturer's instructions using connectors listed for aluminum conductors and listed oxide inhibiting joint compound.
- H. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- I. Install cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours.
- J. Bundle cables where run in groups using listed supports. Provide independent supports directly from structure, do not route through structure or on work of other trades.
- K. Metal Clad Cable, Type MC
1. The use of metal clad cable is not permitted, except for connections to ceiling mounted recessed and semi-recessed luminaires concealed in accessible ceiling where the maximum length is limited to 72-inches.
  2. MC cable is permitted for the following applications:
    - a. Normal power branch circuits between wiring devices and nearest junction box, #10 and smaller, where concealed in walls and ceilings.
      - 1) Provide no more than three MC cable circuit connections per junction box.
      - 2) For power circuits, limit length of MC cable to 12ft from the junction box to the first wiring device and transition circuit to conduit if it continues outside the wall.
      - 3) For lighting circuits, limit length of MC cable to 6ft from the junction box to the first luminaire and extend MC cable to other fixtures in the same room.
  3. MC cable is not permitted for the following:
    - a. Emergency or standby power circuits
    - b. Feeders
    - c. Homeruns to panelboards.
    - d. Branch circuits with conductors larger than #10 AWG.
    - e. Branch circuits serving HVAC, elevator/escalator, medical and kitchen equipment loads.
    - f. Within mechanical, electrical or telecommunication equipment rooms.
    - g. Exposed locations.
    - h. Inaccessible ceiling locations.
    - i. Within masonry walls.
    - j. Exterior or outdoor locations.
    - k. Wet or damp locations.
    - l. Direct buried locations.
  4. Where MC cable is permitted, comply with the following:
    - a. Install MC cables and connectors in accordance with NECA/NACMA 120.
    - b. Use only for single-circuit applications. For devices in the same wall connected to different circuits, install separate single circuit cable for each circuit.
    - c. Support MC cables with clamps, clips, or similar product specifically designed for supporting cables in accordance with NEC and route all runs parallel or perpendicular to building lines with right angle turns complying with manufacturer's bend radius requirements.

- d. Cables shall be bundled where run in groups using listed supports to maintain proper spacing. Where spacing can't be maintained, apply adjustment factors for derating conductors.
- e. Do not route through structure or on work of other trades. Provide independent supports directly from structure.
- f. All MC cable which serves patient care areas shall be type HCF, rated for healthcare use with insulated ground wire and grounded sheath.

L. Control Circuit Conductors and Cables

- 1. Use insulated spade lugs for wire and cable connection to screw terminals.
- 2. Conductors installed within environmental air plenums shall be per NEC. Article 800 and other applicable codes, with FEP-type insulation or an approved equivalent. Provide plenum-rated cable supports where plastic straps or other supports, etc., are installed in plenum areas.
- 3. Where indicated, systems and control conductors that are installed exposed shall not be routed across ceilings or ductwork. Provide independent supports anchored to building structure or other permanent support members.
- 4. Install in such a manner as to not interfere with the access to or operation of equipment or removal of ceiling tiles.
- 5. Nylon tie-wraps shall be installed in such a manner so as to bundle conductors neatly, allowing runouts of single conductors or groups to drop down to equipment served.
- 6. Install grommets where dropping out of trays or into panels or service columns.
- 7. Install sleeves with bushings where penetrating partitions.
- 8. Provide firestopping for penetrations of fire rated assemblies with approved materials.

3.4 SPLICES, TAPS, CONNECTIONS, AND TERMINATIONS

- A. Prepare cable in accordance with the conductor, cable, splice and termination component manufacturers' recommendations and instructions.
- B. Cut conductors and cables using tools and methods which ensure a square cut. Do not nick or damage conductors.
- C. Ensure conductor inserts fully into the connector or termination with the insulation fitting closely to the connector or termination.
- D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B. Where a tightening torque is indicated as a numeric value on equipment or in installation instructions provided by the manufacturer, a calibrated torque tools shall be used to achieve that indicated torque value, unless the equipment manufacturer has provided installation instructions for an alternative method of achieving the required torque.
- E. Splices and Taps
  - 1. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.
  - 2. Make splices and taps in junction boxes or other enclosure approved for the wiring method.
  - 3. For conductors #10 AWG and smaller conductors, use pressure crimp type connections.
  - 4. For conductors #8 AWG and larger, use a hydraulic compression type connection, with cold shrink tubing and tape to restore full insulation value of the wire being spliced.

- F. Connections and Terminations
  - 1. Ensure that conductor temperature and ampacity ratings are compatible with connectors, terminals, and equipment to which they are to be connected.
  - 2. Provide crimp-applied ring or flanged fork type terminals for motor and equipment terminals where such terminals are provided on motor and equipment leads or on all stranded wire terminations using #10 AWG or smaller conductors.
  - 3. Motor Connections shall use connection lugs with motor stub splice insulators.
- G. Wiring at Outlets: Install conductors at each outlet with at least 12 inches of slack.
- H. All cables and wiring, regardless of voltage, installed in manholes or cable vaults shall be routed in such a manner to provide a minimum of 10 feet of slack cable for future splicing. Install cables along walls by utilizing the longer route from entry to exit. If both routes are symmetrical, provide a loop of cable secured to wall. All cables shall be tied to insulated cable supports on wall-mounted racks, spaced a maximum of three feet apart.

### 3.5 PROTECTION

- A. Intentional or unintentional painting of exposed low-voltage and/or control-voltage cabling insulation is prohibited. Ensure that exposed cabling is adequately protected from direct painting or overspray whether painting is required within the electrical specifications or required by other disciplines/trades.
- B. Review the project's painting requirements for all disciplines and provide protection as required.
- C. Where exposed cabling is being installed in exposed ceiling or wall spaces that are required to be painted, provide cabling in enclosed raceways or provide alternate options for cable colors to engineer for approval.

### 3.6 IDENTIFICATION

- A. Comply with Section 260553 "Identification for Electrical Systems."
  - 1. Identify all conductors by means of labels placed on conductors in all junction boxes and at each terminal point with labels indicating source, circuit number or terminal number.
  - 2. Identify each spare conductor at each end with identity number and location of other end of conductor and identify as spare conductor.
  - 3. Identify each control voltage conductor or cable on each end and at each terminal with a number-coded identification tag. Each wire must have a unique tag.
- B. Provide conductors, in all sizes of cable, with continuous solid insulation color(s) from the manufacturer. Taped ends shall not be acceptable.
  - 1. Conductors shall be color coded as follows:
    - a. 120/208 Volt Conductors
      - 1) Phase A: Black
      - 2) Phase B: Red
      - 3) Phase C: Blue
      - 4) Neutral: White
      - 5) Ground: Green
      - 6) Isolated Ground: Green/Yellow
    - b. 277/480 Volt Conductors
      - 1) Phase A: Brown

- 2) Phase B: Orange
- 3) Phase C: Yellow
- 4) Neutral: Gray or White with Brown tracer
- 5) Ground: Green
- 6) Isolated Ground: Green/Yellow
- c. Isolated Power Conductors (Type XLP or XHHN-2)
  - 1) Phase A - Brown
  - 2) Phase B - Orange
  - 3) Phase C - Yellow
  - 4) Neutral - White with brown tracer stripe
  - 5) Note: Provide each phase with tracer color other than white, green, or gray.
- d. Note: Further identify isolated power conductors with ½" wide purple tape at all terminations and junctions.
2. Control voltage wiring color coding shall be consistent throughout the project and shall match existing equipment and standards where applicable. Color coding for each system shall be unique.
3. Conductors within enclosures that may be energized when enclosure disconnect is off - yellow or taped with 1/2" yellow tape every 6" of length, inside enclosure. Provide lamacoid plate warning sign on front of enclosure where this condition occurs.
4. DC Wiring:
  - a. Positive: Light Blue
  - b. Negative: Dark Blue

### 3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Visual Inspections:
  1. Compare cable data with drawings and specifications.
  2. Inspect exposed sections of cable for physical damage and correct connections in accordance with drawings.
  3. Inspect bolted electrical connections for high resistance. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data.
  4. Inspect compression-applied connectors for correct cable match and indentation.
  5. Inspect for correct identification and arrangements.
  6. Inspect cable jacket insulation and condition.
- C. Electrical Tests:
  1. Perform insulation resistance testing for all electrical distribution system feeders unless notes otherwise. Testing may be witnessed by the Engineer and/or Commissioning agent. Schedule all tests with Architect with sufficient notice.
  2. Insulation resistance tests shall be performed at a DC voltage of 1,000 volts for 600 volt rated equipment, and at a DC voltage of 500 volts for 120-300 volt rated equipment. Test duration shall be one minute. Minimum acceptable (temperature corrected) resistance is 25 megohms for 120-300 volt rated equipment and 100 megohms for 600 volt rated equipment and wiring.
  3. Test instruments shall be calibrated to national standards within the last 12 months.
- D. Test and Inspection Reports: Prepare a written report to record the following:
  1. Test procedures used.

2. Results that comply with requirements.
  3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- E. Cables will be considered defective if they do not pass tests and inspections. Remove and replace malfunctioning units and retest as specified above.
- F. Submit test results to Architect and Engineer for approval

**END OF LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

## **SECTION 26 05 33 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS**

### **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions, Division 01 Specification Sections, and Section 260010 – General Requirements for Electrical Systems apply to this Section.

#### 1.2 SUMMARY

- A. This section is intended to specify the raceways, fittings, boxes, cabinets, specialties, and related items necessary to complete the work as shown on the drawings and specified herein.
- B. Section Includes:
  - 1. Metal conduits and fittings
  - 2. Nonmetallic conduits and fittings
  - 3. Surface metal raceway
  - 4. Metal wireways and auxiliary gutters.
  - 5. Boxes, enclosures, and cabinets
  - 6. Wall ducts and trench ducts.
- C. Related Requirements:
  - 1. Refer to Division 07 firestopping section and Section 260010 “General Requirements for Electrical Systems” for penetration firestopping requirements related to electrical pathways and boxes.

#### REFERENCES

#### D. Abbreviations

- 1. EMT: Electrical Metallic Tubing
- 2. FMC: Flexible Metal Conduit
- 3. GRC: Galvanized Rigid Steel Conduit
- 4. IMC: Intermediate Metal Conduit
- 5. LFMC: Liquid-tight Flexible Metal Conduit.
- 6. RAC: Rigid Aluminum Conduit
- 7. RMC: Rigid Metal Conduit

#### E. Definitions

- 1. Outlet: A point on the wiring system at which current is taken to supply utilization equipment.
- 2. Raceway: an enclosed channel designed for enclosing and protecting electrical, communications, and signaling wires and cables.

- F. Reference Standards: The following publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest version as of the date of the Contract Documents, unless otherwise specified.
1. National Electrical Contractors Association (NECA)
    - a. NECA 101 - Standard for Installing Steel Conduits (RMC, IMC, EMT)
    - b. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC)
  2. National Electrical Manufacturers Association (NEMA)
    - a. NEMA FB 2.10 - Selection and Installation Guidelines for Fittings for Use with Non-Flexible Metallic Conduit or Tubing (Rigid Metal Conduit, Intermediate Metal Conduit, and Electrical Metallic Tubing)
    - b. NEMA FB 2.20 - Selection and Installation Guidelines for Fittings for Use with Flexible Electrical Conduit and Cable
    - c. NEMA RV 3 - Application and Installation Guidelines for Flexible and Liquid-tight Flexible Metal Conduits

### 1.3 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop drawings: For custom enclosures, cabinets, or boxes.

## **PART 2 - PRODUCTS**

### 2.1 GENERAL REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

### 2.2 METAL CONDUIT AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  1. AFC Cable Systems, Inc.
  2. Allied Tube & Conduit.
  3. Anamet Electrical, Inc.
  4. Calconduit
  5. Electri-Flex Company.
  6. Nucor Tubular Products.
  7. O-Z/Gedney.
  8. Picoma Industries.
  9. Robroy Industries.
  10. Southwire Company.
  11. Thomas & Betts Corporation.
  12. Western Tube and Conduit Corporation.
  13. Wheatland Tube Company.



- B. Electrical Metallic Tubing (EMT) and Elbows:
  - 1. Comply with ANSI C80.3 and UL 797.
- C. Galvanized Rigid Steel Conduit (GRC, RMC) and Elbows:
  - 1. Comply with ANSI C80.1 and UL 6.
  - 2. Zinc coating both inside and outside by means of hot-dip galvanizing.
  - 3. Use only threaded fittings for GRC.
- D. Intermediate Metal Conduit (IMC) and Elbows:
  - 1. Comply with ANSI C80.6 and UL 1242
- E. Flexible Metal Conduit (FMC):
  - 1. Comply with UL 1.
  - 2. Continuous interlocked hot-dip zinc galvanized steel with smooth interior and exterior.
  - 3. Suitable for dry locations.
- F. Liquid-tight Flexible Metal Conduit (LFMC):
  - 1. Comply with UL 360.
  - 2. Continuous interlocked hot-dip zinc galvanized steel core with smooth interior and exterior.
  - 3. Suitable for wet and dry locations, direct burial applications, and concrete encasement.
  - 4. Sunlight resistant, flame retardant thermoplastic PVC jacket resistant to heat, oil, and chemical breakdown.
- G. Metal Fittings
  - 1. Comply with NEMA FB1 and UL 514B.
  - 2. Listed and labelled for type of conduit, location, and use.
  - 3. Fittings for EMT:
    - a. Compression type, zinc-plated galvanized steel.
    - b. Concrete-tight- or rain-tight, hardened steel locknuts, and nylon insulating throats.
  - 4. Fittings for GRC and IMC:
    - a. Threaded zinc plated steel.
    - b. Concrete-tight- or rain-tight, nylon insulating throats.
  - 5. Conduit Bodies:
    - a. Material: gray iron or heavy copper-free cast aluminum
    - b. Available in varying configurations with integral bushing and gasketed coverplate.
  - 6. Expansion/Deflection Fittings: UL 651 listed, manufactured coupling accommodating 3/4-inch linear movement from normal and 30-degree angular movement in all directions
    - a. Basis of Design: OZ/Gedney DX
    - b. PVC or steel sleeve to match conduit type with neoprene jacket, rated for environmental conditions where installed.
    - c. Integral braided copper bonding jumper.
  - 7. Fittings for FMC and LFMC:
    - a. LFMC: Tubular Steel, zinc-plated with gland nut, sealing ring, high tensile grounding ferrule, insulated throat, and body for liquid tight connection.
  - 8. Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
  - 9. "Kwik-Couple" type fittings are not permitted.
  - 10. Indentation, set-screw, or die-cast fittings are not permitted.
- H. Joint Compound for threaded conduit: UL 2419 listed for use in conduit assemblies and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

## 2.3 NON-METALLIC CONDUITS AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Allied Tube & Conduit
  2. Cantex
  3. Carlon
  4. Heritage Plastics
  5. National Pipe & Plastics
  6. Prime Conduit
- B. Rigid Polyvinylchloride (PVC) Conduit:
1. Comply with NEMA TC-2 and UL 651.
  2. Sunlight resistant and suitable for use with 90 degree C conductors.
  3. Type EPC-40 suitable for normal duty applications.
  4. Type EPC-80 suitable for heavy duty applications.
- C. Non-Metallic Fittings
1. Comply with NEMA TC 3 and UL514B.
  2. Listed and labelled for type of conduit, location, and use.
  3. Compatible with conduit type and material.
  4. Solvents and Adhesives: as recommended by conduit manufacturer.

## 2.4 SURFACE MOUNTED METAL RACEWAY

- A. Manufacturers: Subject to compliance with requirements, provide products from one of the following:
1. Hubbell
  2. Mono-Systems
  3. Wiremold
- B. Source Limitations: Obtain surface metal raceway, components, outlets, and fittings from single manufacturer.
- C. Single and Multi-Channel Raceways:
1. Two-piece design with base and snap on cover complying with UL 5, suitable for use with electrical branch circuit wiring, data/voice network cabling, and low voltage wiring.
  2. Material: Galvanized Steel
  3. Finish: Manufacturer's standard enamel finish in color selected by Architect, suitable for field painting to match adjacent surfaces.
  4. Size: Available in varying widths, selected to accommodate number of conductors and services indicated on drawings with a maximum of 40-percent fill.
- D. For multi-channel configurations, provide integral divider separating raceway into equal compartments for power and low voltage wiring.
- E. Fittings: Include clips, straps, couplings, elbows, tees, connectors, and bushings suitable for interconnecting raceway segments in various configurations. Fittings to overlap raceway and hide uneven cuts. Material and finish to match raceway.

- F. Device Boxes: single and multi-gang configurations, suitable for mounting standard devices and faceplates. Material and finish to match raceway.
- G. Device Plates: sized to match raceway width with openings suitable for mounting various standard power and communications devices. Material and finish to match raceway.
- H. Device Brackets: suitable for mounting standard single or two-gang devices horizontally or vertically within large raceways.
- I. Plugmold: steel surface metal raceway with integral Simplex NEMA 5-20R outlets spaced 12-inches on center or as indicated on drawings.

## 2.5 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Eaton B-Line
  - 2. Hubbell Wiegmann.
  - 3. nVent Hoffman.
  - 4. Square D.
- B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise required by environmental application, and sized according to NFPA 70. Minimum of 14-gauge steel before finishes are applied.
- C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for a complete system.
  - 1. Provide knockouts on all runs, unless otherwise indicated or prohibited by codes.
  - 2. Provide dividers to separate conductors of different insulation levels or where required by equipment vendor installation instructions.
- D. Wireway Covers: Furnish with continuous hinged covers on all runs and removable covers on all fittings unless otherwise noted, to allow a continuous unobstructed path for conductor installation.
- E. Finish: Manufacturer's standard enamel finish resistant to corrosion, moisture, and oil.
- F. Size: available in nominal sizes 2-1/2-inch by 2-1/2-inch, 4-inch by 4-inch, 6-inch by 6-inch or 12-inch by 12-inch.
- G. Install supports to allow unobstructed access to wireway interior. Use minimum 1/4-inch rod hangers for up to 4-inch by 4-inch wireway, 3/8-inch rod up to 8-inch by 8-inch wireway, and 1/2-inch rod for 12-inch by 12-inch wireway.

## 2.6 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Eaton Crouse-Hinds.
  - 2. Emerson/Appleton Electric.

3. FSR Inc.
  4. Garvin Industries
  5. Hoffman.
  6. Hubbell Killark.
  7. Milbank Manufacturing Co.
  8. Mono-Systems, Inc.
  9. O-Z/Gedney.
  10. RACO / Hubbell.
  11. Stahlin Non-Metallic Enclosures.
  12. Thomas & Betts.
  13. Wiremold / Legrand.
- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets shall be listed for intended use.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy or aluminum, Type FD, with gasketed cover.
- E. Luminaire Outlet Boxes: Non-adjustable, designed for attachment of luminaires, listed and marked for the maximum allowable weight with at least a 2.0 safety factor for the anticipated fixture weight.
- F. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb.
- G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1, constructed of code gauge, galvanized steel with sides formed and corner seams riveted or welded before galvanizing
- H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.
- I. For box extensions and mud rings used to accommodate building finishes, provide with same material as recessed box.
- J. Minimum Device Box Dimensions unless noted otherwise:
1. Single gang: 4-inches square by 2-1/8-inches deep with single gang extension ring.
  2. Two gang: 4-inches square by 2-1/8-inches deep with two-gang extension ring.
  3. Three gang: 8-5/8-inches by 4-1/2-inches by 2-1/2-inches deep with three gang extension ring.
  4. Four gang: 10-7/16-inches by 4-1/2-inches by 2-1/2-inches deep with four gang extension ring.
- K. Gangable boxes are prohibited.
- L. Boxes assembled with sheet metal screws are prohibited.
- M. Hinged Cover Enclosures: Comply with UL 50 and NEMA 250, suitable for installed environment with continuous-hinge cover and flush latch unless noted otherwise.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
  2. Nonmetallic Enclosures: Fiberglass
  3. Interior Panels: Steel, all sides finished with manufacturer's standard enamel.

### **PART 3 - EXECUTION**

#### 3.1 RACEWAY APPLICATION

- A. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for selection of raceways. Consult Architect for resolution of conflicting requirements.
- B. Apply raceway products as specified below unless otherwise indicated:
1. Exterior and Exposed: GRC
  2. Concealed Underslab: GRC or PVC Type EPC-40 where approved.
  3. Concealed Underslab with conductors above 600V: Concrete encased GRC or concrete encased PVC Type EPC-40 where approved.
  4. Interior, Concealed in Ceilings, Walls, and Partitions: EMT, IMC, or GRC
  5. Interior, Concealed in Concrete or Grouted Masonry Walls and Partitions: IMC or GRC
  6. Interior, Damp or Wet Locations: GRC
  7. Interior, Where exposed and Not Subject to Physical Damage: EMT, GRC, or IMC.  
Raceway locations include the following:
    - a. Electrical Rooms
  8. Interior, Where Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
    - a. Loading dock.
    - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    - c. Mechanical rooms (below 8'-0").
    - d. Gymnasiums.
  9. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  10. Connection to ceiling mounted recessed and semi-recessed luminaires and electrical devices: FMC.
  11. Boxes and Enclosures: NEMA 250, Type 1 except as follows:
    - a. Damp or Wet locations: NEMA 250, Type 3R
    - b. Commercial/Institutional Kitchens and Cafeterias: NEMA 250, Type 3R
    - c. Corrosive environments: NEMA 250, Type 4X
  12. Exposed Boxes subject to physical damage: Die cast metal boxes with threaded hubs.
  13. EMT is not permitted underslab, embedded in concrete slabs, or where exposed to physical damage.
  14. Non-metallic conduit is not permitted for the following applications unless approved by the Engineer:
    - a. Interior Locations including environmental air plenums.
    - b. Applications where a redundant ground fault path is required by code.
  15. Flexible non-metallic conduit is not permitted.
  16. Unless otherwise indicated on the drawings, intermediate metal conduit (IMC) may be used in any location in place of rigid galvanized steel conduit (GRC), where permitted by codes, and where approved by the Engineer.
- C. Minimum Raceway Size: 3/4-inch trade size unless noted otherwise on the drawings.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
  2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after

- installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
  4. Flexible Conduit: Use only steel fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth or where prolonged contact with construction materials will degrade the aluminum.
- F. Install raceways and fittings in a manner to avoid use of dissimilar metals that would result in galvanic action corrosion.
- G. Install surface conduits or raceways only where indicated on Drawings.
- H. Do not install surface conduits or raceways on exterior facades unless approved by Engineer.
- I. Do not install nonmetallic conduit where ambient temperature or operating temperature of the conductors exceeds the rating of the raceway.
- J. Conduit installed embedded in concrete slabs is not permitted.

### 3.2 RACEWAY INSTALLATION

- A. Comply with requirements in Section 260500 "Common Work Results for Electrical Systems" for hangers and supports.
- B. Comply with NECA 1, NECA 101, NECA 111 and manufacturer's written instruction for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- C. Complete raceway installation before starting conductor installation.
- D. Comply with utility company requirements for raceways and boxes containing utility company conductors.
- E. Size raceways to conform with Annex C, of the National Electrical Code, unless otherwise shown on the Contract Drawings.
- F. Level and square raceway runs and install at proper elevations and required heights. Hold tight to structure wherever possible, to maximize available space and not restrict other trades.
- G. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated.
- H. Install conduits with runs parallel or perpendicular to building lines, walls, structural members or intersections of vertical planes and ceilings, with right angle turns consisting of cast metal fittings or symmetrical bends unless otherwise shown. Randomly routed conduits are not acceptable.
- I. Make bends in raceway using large-radius preformed elbows. Provide concentric bends for parallel runs of conduit. Conform with NFPA 70 minimum radii requirements for field bending. Use only equipment specifically designed for material and size involved.

- J. Install no more than the equivalent of three 90-degree bends in any conduit run. Support within 12-inches of changes in direction.
- K. Provide junction boxes or pull boxes so that conduit runs do not exceed 100 feet, or as shown on the Contract Drawings. Size junction boxes per NEC, Article 370.
- L. Provide conduit supports spaced not more than 8-feet apart.
- M. Support conduit within 12-inches of enclosures to which attached.
- N. Do not drill into bar joists to support raceways or cables.
- O. Install conduits at least 12-inches away from flues, steam, or hot water pipes.
- P. Conduit installed under concrete slabs is permitted for feeders and for branch circuits serving floor outlets. Underslab conduit is prohibited for other locations unless noted on the drawings or with permission of the engineer. Where approved, comply with the following:
  - 1. Locate raceway a minimum of 12-inches below the bottom of slab.
  - 2. Provide minimum 2-inch spacing between conduits to ensure proper compaction of structural fill.
  - 3. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
  - 4. Transition underslab RNC to GRC for all bends larger than 20-degrees and for all stub-ups through a slab on grade. Arrange stub-ups so curved portions of bends are not visible above finished slab. Extend GRC stub-ups a minimum of 6" above the concrete slab. Schedule 80 PVC stub-ups are allowed where approved by engineer.
  - 5. Seal around conduits when penetrating vapor barriers.
  - 6. Where installed in corrosive soils, coat all underslab rigid steel conduit with two coats of bitumastic paint such as "Asphaltum".
- Q. Where raceways are subject to environmental changes, locate seals immediately at the boundary so no fittings or boxes are between the seal and the change of environments that would allow migration of condensation within the raceway system. Seal the interior of all raceways at the following points:
  - 1. Where conduits pass from cold to warm locations, such as boundaries of refrigerated spaces and at building wall and roof penetrations.
  - 2. Where an underground service raceway enters a building or structure.
  - 3. Conduit extending from interior to exterior of building.
  - 4. Conduit extending into pressurized duct and equipment.
  - 5. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
  - 6. Where otherwise required by NFPA 70.
- R. Install conduits in a manner to ensure against collection of trapped condensation. Arrange all runs of conduit to be devoid of traps. Provide trapped conduit runs with explosion proof drains at low points.
- S. At hazardous locations, install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed non-shrink sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish like that of adjacent plates or surfaces.

- T. Coordinate with other trades, including metal and concrete deck trades, as necessary to interface installation of electrical raceways and components.
- U. Complete installation of electrical raceways before starting installation of cables or wires within raceways.
- V. Take precautions to prevent the lodgment of dirt, plaster, or trash in all conduit or tubing, fittings and boxes during construction. Use mandrel to clean all conduit for floor boxes or conduit below grade and ensure its swabbed free of debris or moisture before wiring is installed.
- W. Unless using GRC, do not locate conduits, cables, raceways, and enclosures within 2 inches of bottom of metal-corrugated sheet roof decking, measured from the lowest surface of the roof decking to the top of the conduit, cable, raceway, or box.
- X. Conduits, cables, raceways, and enclosures are not permitted in concealed locations of metal-corrugated sheet decking type roofing.
- Y. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72-inches of flexible conduit for ceiling mounted recessed and semi-recessed luminaires, and 36-inches for all other equipment subject to vibration, noise transmission, or movement, and for transformers and motors.
  - 1. Install as a single piece with clamp-on insulated throat connectors designed for the purpose.
  - 2. Provide strain relief fittings where subject to vibration.
  - 3. Provide an equipment grounding conductor and bonding jumper at all locations.
  - 4. For LFMC, provide a minimum of 18-inches and loop to avoid restraining vibrating equipment.
- Z. Stub-ups to Accessible Ceilings:
  - 1. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or into an enclosure.
  - 2. Where conduits terminate at a cable tray pathway, provide listed fitting to secure conduit to cable tray.
- AA. Mechanically fasten conduit terminations at a wireway, provide metal insulated bushings, and bond to the wireway with bonding jumper.
- BB. Furnish conduit bodies in proper configurations, avoiding excessive openings. Any openings that are left shall be properly plugged. Wiring splices within conduit bodies are not permitted.
- CC. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- DD. Provide a completely separate raceway system, including junction boxes and pull-boxes, for each emergency power, optional stand-by, and normal power system for complete separation in accordance with NEC.
- EE. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of secured slack at each end of pull wire. Secure pull string at each end and cap raceways.



- FF. Coordinate with vendors and provide extra pull-strings as required to ensure enough pull strings.
- GG. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length. Ream inside of conduit to remove burrs.
- HH. Raceway Fittings: Install fittings in accordance with NEMA FB 2.10 guidelines
  - 1. Install raceways square to enclosures and terminate with appropriate fitting:
  - 2. For enclosures without hubs, terminate with appropriate fitting, insulated throat liner, and case-hardened locknuts on both sides of enclosure wall.
  - 3. Terminate rigid conduits with threaded hubs or with locknuts on inside and outside of enclosure and insulated throat metal bushing.
  - 4. Install locknuts hand tight, plus one-quarter turn more.
  - 5. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
  - 6. All threaded fittings shall engage a minimum of seven full threads. Fasteners shall be properly torqued to manufacturer's recommendations.
  - 7. Split sleeve insulators are not permitted.
- II. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- JJ. Expansion-Joint Fittings:
  - 1. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
  - 2. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- KK. Where raceways penetrate rooms or walls with acoustical requirements, seal raceway openings on both sides of penetration with acoustically rated putty or sealant.
- LL. Do not install raceways or electrical items on "explosion-relief" walls.
- MM. Coordinate penetration elevation and spacing for all penetrations through high challenge fire walls so no penetration is located more than 36-inches above finished floor level.
- NN. Surface Raceways:
  - 1. Provide surface metal raceways where indicated on drawings or approved by the Engineer.
  - 2. Provide all trim and cover fittings, flush feed boxes, splices, and outlet fittings necessary for a complete installation.
  - 3. Provide multi service raceway with divider for locations that require power and low-voltage wiring.
  - 4. Install surface raceway with a minimum 2-inch radius control at bend points.
  - 5. Secure surface raceway with two-hole straps at intervals not exceeding 24-inches and within 6-inches of boxes, transitions, and turns. Provide no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
  - 6. Provide box connector and junction box immediately above ceiling for transitioning raceway to conduit.

OO. Trench and Wall Ducts:

1. Trench and wall duct assemblies shall be constructed and installed in an electrically and mechanically continuous manner and in accordance with the manufacturer's installation instructions and recommendations.
2. Where wall ducts are installed flush either vertically or horizontally as a collector duct, provide proper blocking and support in stud walls, adding a layer of studs as needed to prevent undercutting major structural elements of walls. Flush mounted wall ducts trim flange shall be set tight to wall surface with 1/16-inch tolerance each way.
3. Trench duct is to be installed flush with finished concrete floor slab with a vertical tolerance to adjacent surfaces of 1/16-inch plus or minus. Adjust duct position by adjusting leveling screws as required.
4. Prior to concrete pour around trench duct, seal any gaps in the system with sealing compound recommended by trench duct manufacturer or tape to prevent mortar or concrete from entering system.
5. Adjust partition dividers and support columns as required to be level with the bottom of the cover plate. Weld dividers in place at 2-foot on center.
6. Prior to installation of cables, remove any burrs or sharp edges on material and clean inside of duct of any moisture, dust or debris.

3.3 BOX AND ENCLOSURE INSTALLATION

- A. Provide electrical outlets and enclosures as required for splices, taps, wire pulling, and equipment connections.
- B. Provide pull boxes as required to maintain conduit run and bend limitations specified herein.
- C. Size all outlets, pull boxes, junction boxes, cabinets, etc., per adopted edition of the National Electrical Code.
- D. Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- E. Install interior and exterior outlet boxes recessed in building construction with face or cover flush with finished surfaces unless noted otherwise. Where outlet boxes are installed in walls of glazed tile, brick, concrete block, or in walls covered by wood wainscot or paneling, provide deep box to ensure the outlet boxes are installed straight and secure in walls.
- F. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements and architectural elevations. Install boxes with height measured to center of box unless otherwise indicated.
- G. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box. Do not split the mortar joint
- H. Provided 3/4-inch rigid conduit pendants where lighting fixtures, appliances, or wiring devices are to be suspended from ceiling outlet boxes. Outlet boxes shall be malleable iron, provided with self-aligning covers with swivel ball joint and #14-gauge steel locking ring. Provide safety chain between building structure and housing for all fixtures, appliances, or devices greater than 10 lbs weight. Install fixtures plumb and level. Cover pendants shall be finished to match fixtures.

- I. Horizontally separate boxes mounted on opposite sides of walls, so they are not in the same vertical channel.
- J. Locate boxes so that cover or plate does not span different building finishes.
- K. Provide spanner bars to support all boxes from more than one side by spanning two framing members.
- L. Fasten boxes up to 4-11/16 square size to their mounting surface or support with two fasteners of proper size. Fasten larger sizes with four fasteners, minimum.
- M. Support boxes recessed in ceilings independent of ceiling tiles and ceiling grid.
- N. Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits or ceiling support wires.
- O. Provide all cabinets and boxes for NEMA 1 applications with knockouts, as necessary, or field cut with approved cutting tools which will provide a clean, symmetrically cut opening to maintain UL listing of enclosure.
- P. Replace any unused knockouts or openings with a listed knockout closure.
- Q. Coordinate with equipment vendors to provide special sized outlet boxes to support installed equipment.
- R. Where boxes and enclosures are located in areas or on walls with acoustical requirements, seal openings and knockouts in back and sides of boxes with acoustically rated putty or sealant and provide gasket for wall plates and covers.

### 3.4 GROUNDING AND BONDING

- A. Bond all metal boxes, junction boxes and pull boxes with pigtails to the equipment grounding conductor.
- B. Provide insulated throat grounding bushings with appropriately sized bonding jumpers for the following locations to maintain electrical continuity between the raceway and enclosure:
  - 1. Metal raceways and enclosures that contain service conductors.
  - 2. Metal raceways and enclosures that contain grounding electrode conductors.
  - 3. Where metal raceways containing circuits over 250V terminate in a concentric or eccentric knockout at cabinets, enclosures, or sheet metal pull boxes listed in accordance with UL 50.
  - 4. Where the integrity of a concentric or eccentric knockout has been compromised.
  - 5. Metal raceways and enclosures that contain feeders.

### 3.5 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
  - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

- B. Protect threads on conduits and fittings with plastic protectors or other means to prevent damage prior to installation.
- C. Provide protection for all conduit stubbed through floor during construction with plastic caps approved for this purpose.

### 3.6 IDENTIFICATION

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
- B. Identify all junction, outlet and pull boxes in data/mechanical/electrical rooms and above ceilings with panel and circuit designation on outside of covers. Identify all exposed junction, outlet and pull boxes in finished areas with panel and circuit designation on inside of covers.

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- C. Provide black finish for exposed raceways and junction boxes in theaters.

### 3.7 PAINTING

- A. Raceways installed in exterior locations shall receive one coat of primer, two coats finish paint after preparation of galvanizing, color selected by Architect.
- B. Exposed raceways in painted interior areas shall be painted to match adjacent finishes.

## **END OF RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS**

## **SECTION 26 05 43 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS**

### **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions, Division 01 Specification Sections, and Section 260010 "General Requirements for Electrical Systems" apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Direct-buried and concrete-encased conduits, ducts, and duct accessories.
  - 2. Handholes and boxes.
  - 3. Manholes.
  - 4. Utility Structure accessories.
- B. Related Requirements:
  - 1. Refer to Section 260533 "Raceways and Boxes for Electrical Systems" for pathway requirements installed under building slabs.

#### 1.3 REFERENCES

- A. Abbreviations
  - 1. GRC: Galvanized rigid conduit.
  - 2. IMC: Intermediate metal conduit.
  - 3. RNC: Rigid nonmetallic conduit.
- B. Definitions
  - 1. Backfill: Earth or other controlled material placed in trenches for filling and grading back to a finished state.
    - a. Initial Backfill (encasement): Backfill placed beside and over conduit arrangements in a trench, including haunches to support sides of conduits.
    - b. Final Backfill: Backfill placed over initial backfill to fill a trench.
  - 2. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying conduit.
  - 3. Duct: A single or multiple underground conduits encased in concrete or direct buried.
  - 4. Duct Bank: An arrangement of two or more ducts installed together.
  - 5. Encasement: Material placed around a duct or duct bank to provide additional protection.
  - 6. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.
- C. Reference Standards: The following publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest version as of the date of the Contract Documents, unless otherwise specified.
  - 1. National Electrical Manufacturers Association (NEMA):

- a. NEMA TCB-2 "Guidelines for the Selection and Installation of Underground Nonmetallic Raceways".

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For Precast or Factory-Fabricated Concrete Underground Utility Structures submit information to demonstrate compliance with drawings and specifications:
  - 1. Include structural fabrication drawings stamped by a Structural Engineer licensed by the state in which the work is performed. Drawings shall detail concrete and reinforcement requirements.
  - 2. Include plans, elevations, sections, details, attachments to other work, and accessories.
  - 3. Include duct entry provisions, including locations and duct sizes.
  - 4. Include reinforcement details.
  - 5. Include frame and cover design
  - 6. Include manhole frame support rings.
  - 7. Include Ladder details.
  - 8. Include grounding details.
  - 9. Include dimensioned locations of cable rack inserts, pulling-in and lifting irons, and sumps.
  - 10. Include joint details.
- C. Duct-Bank Coordination Drawings: Show duct profiles and coordination with other utilities and underground structures along with dimensions from buildings or other benchmarks.
  - 1. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.
- D. Field quality-control reports including digital photographs of all concealed work.
- E. Closeout Submittals
  - 1. In addition to items specified in Division 01 and Section 260010 "General Requirements for Electrical Systems", ensure all utilities, structures, and underground conduits are surveyed and recorded on as-built drawings.

#### 1.5 FIELD CONDITIONS

- A. Ground Water: Assume ground-water level is at grade level unless a lower water table is noted on Drawings.

### **PART 2 - PRODUCTS**

#### 2.1 GENERAL REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with IEEE C2 and NFPA 70.

## 2.2 CONDUITS AND FITTINGS

- A. Comply with 260533 "Raceways and Boxes for Electrical Systems".

## 2.3 DUCT ACCESSORIES

- A. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and size of ducts with which used, and selected to provide minimum duct spacing indicated while supporting ducts during encasement or backfilling.
- B. Fabric Innerduct: Continuous, nylon resin polyester, multi -pocket fabric innerduct, with internal pull tape. Maxcell or equal.
- C. Pull Line: Flat, woven, polyester or polyaramid tape, low stretch, pre-lubricated for reduced friction. Strength suitable for required pulling tensions with a minimum of 200-lb. Muletape or equal.
- D. Underground Detectable Warning Tape: Flexible tape constructed with solid aluminum foil backing and clear film laminate, 6-inches wide, 5-mil overall thickness.
  - 1. Suitable for the method of installation and locating underground utility lines.
  - 2. Chemically inert tape material and ink, resistant to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
  - 3. Comply with APWA Uniform Color Code.
  - 4. Inscriptions for Red-Colored Tapes: "CAUTION BURIED ELECTRIC LINE BELOW".
  - 5. Inscriptions for Orange-Colored Tapes: "CAUTION BURIED COMMUNICATIONS LINE BELOW".
- E. Duct Sealants: Re-enterable, two-part, closed-cell urethane foam capable of sealing conduits with multiple cable configurations.
  - 1. Capable of withstanding temperatures from -40 deg F to 200 deg F and holding 22 feet waterhead pressure continuous.
  - 2. Chemically resistant to gasoline, oils, dilute acids, and bases.
  - 3. Compatible with cable jacket and shall not affect the physical or electrical properties of wire and cable.
  - 4. Workable at temperatures as low as 35 deg F.
  - 5. UL94 Class HBF fire retardant rating.

## 2.4 POLYMER CONCRETE HANDHOLES AND BOXES

- A. Description: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Armorcast
  - 2. NewBasis
  - 3. Oldcastle
  - 4. Hubbell Quazite
- C. General Requirements:

1. Comply with SCTE 77. Minimum Tier 15.
2. Color: Gray.
3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, as indicated for each service.

## 2.5 PRECAST CONCRETE MANHOLES AND HANDHOLES

- A. Description: Factory fabricated, one-piece units and units with interlocking mating sections, complete with accessories, hardware, and features. Frame and cover shall have load rating consistent with that of structure.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  1. Christy Concrete Products
  2. Oldcastle
  3. Utility Concrete Products
  4. Utility Vault Co
- C. Comply with ASTM C 858.
- D. Precast reinforced-concrete, H-20 structural load rating according to AASHTO HB 17.
- E. Windows: Precast openings in walls, arranged to match dimensions and elevations of approaching ducts and duct banks, plus an additional 12 inches vertically and horizontally to accommodate alignment variations.
  1. Locate windows no less than 6 inches from interior surfaces of walls, floors, or roofs of structure, but close enough to corners to facilitate racking of cables on walls.
  2. Provide window opening with cast-in-place, welded-wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct banks.
  3. Provide window opening frame with at least two additional No. 3 steel reinforcing bars in concrete around each opening.
  4. Provide windows 1-1/2 to 2 inches thick.
- F. Duct Entrances in Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.
  1. Type and size shall match fittings to duct or conduit to be terminated.
  2. Fittings shall align with elevations of approaching ducts and be located near interior corners of structures to facilitate racking of cable.
- G. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.
- H. Provide ventilation openings where indicated on drawings.
- I. Frames, Covers, and Chimney Components: Comply with structural design loading specified for structure.
  1. Frame and Cover: Weatherproof, gray cast iron complying with ASTM A 48/A 48M, Class 35 cast iron with milled cover-to-frame bearing surfaces; diameter, 32 inches.

## UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS



- a. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
- b. Special Covers: Recess in face of cover designed to accept finish material in paved areas.
2. Cover Legend: Cast in. Selected to suit system.
  - a. All covers shall be provided with 2-inch lettering and with the structure number, assigned by Owner, welded onto the cover if not provided by the manufacturer.
  - b. All covers shall be provided with stainless steel drop handles.
3. Chimney Components: Precast concrete rings with dimensions matched to those of roof opening.
  - a. Mortar for Chimney Ring and Frame and Cover Joints: Comply with ASTM C 270, Type M, except for quantities less than 2.0 cu. ft. (60 L) where packaged mix complying with ASTM C 387, Type M, may be used.
  - b. Seal joints watertight using preformed plastic or rubber conforming to ASTM C 990. Install sealing material according to the sealant manufacturers' printed instructions.
- J. Sump Frame and Grate: ASTM A 48/A 48M, Class 30B, gray cast iron.
- K. Pulling Eyes in Concrete Walls: Eyebolt with reinforcing-bar fastening insert, 2-inch diameter eye, and 1-by-4 inch bolt.
  1. Working Load Embedded in 6-Inch, 4000-psi Concrete: 13,000-lbf minimum tension.
- L. Pulling-In and Lifting Irons in Concrete Floors: 7/8-inch diameter, hot-dip galvanized, bent steel rod; stress relieved after forming; and fastened to reinforcing rod. Exposed triangular opening.
  1. Ultimate Yield Strength: 40,000-lbf shear and 60,000-lbf tension.
- M. Bolting Inserts for Concrete Utility Structure Cable Racks and Other Attachments: Flared, threaded inserts of noncorrosive, chemical-resistant, nonconductive thermoplastic material; 1/2-inch ID by 2-3/4 inches deep, flared to 1-1/4 inches minimum at base.
- N. Tested Ultimate Pullout Strength: 12,000 lbf minimum.
- O. Ground Rod Sleeve: 3-inch, PVC conduit sleeve in floors 2 inches from the wall adjacent to, but not underneath, the ducts routed from the facility.
- P. Expansion Anchors for Installation after Concrete Is Cast: Zinc-plated, carbon-steel-wedge type with stainless-steel expander clip with 1/2-inch bolt, 5300-lbf rated pullout strength, and minimum 6800-lbf rated shear strength.
- Q. Cable Rack Assembly: Steel, hot dip galvanized, except insulators.
  1. Stanchions: T-section or channel; 2-1/4-inch nominal size; punched with 14 holes on 1-1/2-inch centers for cable-arm attachment.
  2. Arms: 1-1/2 inches wide, lengths ranging from 3 inches with 450-lb minimum capacity to 18 inches with 250-lb minimum capacity. Arms shall have slots along full length for cable ties and be arranged for secure mounting in horizontal position at any vertical location on stanchions.
  3. Insulators: High-glaze, wet-process porcelain arranged for mounting on cable arms.
- R. Fixed Ladders & Extension: Arranged for attachment to wall of manhole. Ladder and mounting brackets and braces shall be fabricated from hot-dip galvanized steel.

## 2.6 SOURCE QUALITY CONTROL

- A. Test and inspect precast concrete utility structures according to ASTM C 1037.
- B. Nonconcrete Handhole and Pull-Box Prototype Test: Test prototypes of manholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
  - 1. Tests of materials shall be performed by an independent testing agency.
  - 2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
  - 3. Testing machine pressure gages shall have current calibration certification, complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

## **PART 3 - EXECUTION**

### 3.1 PREPARATION

- A. Coordinate layout and installation of ducts, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify Architect if there are obstructions or conflicts between areas of excavation and existing structures or archaeological features to remain.
- B. Coordinate elevations of ducts and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of ducts and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct runs drain to manholes and handholes, and as approved by Architect.
- C. All necessary precautions shall be taken by the contractor during construction to prevent the lodging of dirt, plaster or trash in all conduit, tubing, fittings and boxes.

### 3.2 UNDERGROUND DUCT APPLICATION

- A. Apply underground duct products as specified unless noted otherwise:
  - 1. Refer to Section 260533, "Raceways and Boxes for Electrical Systems" for additional requirements related to underground conduit below building slabs.
  - 2. Ducts for Utility Company primary conductors: comply with utility company standards unless noted otherwise.
  - 3. Ducts for Electrical Service Secondary Conductors: RNC, Type EPC-40 PVC, in concrete-encased duct bank unless otherwise indicated.
  - 4. Ducts for Electrical Cables greater than 600 V: RNC, Type EPC-40 PVC, in concrete-encased duct bank unless otherwise indicated.
  - 5. Ducts for Electrical Feeders 600 V and Less: RNC, Type EPC-40 PVC, in concrete-encased duct bank unless otherwise indicated.
  - 6. Ducts for Electrical Branch Circuits: RNC, Type EPC-40 PVC, in direct buried duct bank unless otherwise indicated.
  - 7. Ducts for Communications Cables: RNC, Type EPC-40 PVC, in direct buried duct bank unless otherwise indicated.

8. Underground Ducts 600V and less Crossing Driveways and Roadways: RNC, Type EPC-40-PVC, encased in reinforced concrete. Extend reinforcement a minimum of 5-feet beyond the edge of paved surfaces.

B. Minimum Cover Requirements: Provide reinforced concrete encasement where minimum depths are not achievable.

1. Electrical Primary or Conductors more than 600V: 48-inches unless otherwise indicated by utility company requirements.
2. Electrical Secondary Service and Feeders: 36-inches
3. Electrical Branch Circuits: 24-inches
4. Communications: 30-inches

C. Transition RNC to GRC for all stub-ups and building enclosure penetrations. Use fittings manufactured for RNC-to-GRC transition.

1. Arrange stub-ups so curved portions of bends are not visible above grade. Increase burial depth where required to maintain cover for curves and bends.
2. Do not use steel raceways for equipment stub-ups where prohibited by utility company standards.

D. Minimum Underground Raceway Size: 1-inch trade size unless noted otherwise on the drawings.

### 3.3 EARTHWORK

A. Contractor shall accept the site as they find it and remove all trash, rubbish, and material from the site prior to starting excavation work.

B. Subsurface Data

1. Subsurface investigations have been performed and the results provided with the contract documents. The information was obtained primarily for use in preparing foundation design. Each contractor may draw their own conclusions therefrom. No responsibility is assumed by the Owner for subsoil quality or conditions other than at the locations and at the time the investigations were made.
2. Materials to be excavated shall be unclassified, and shall include earth, rock, or any other material encountered in the excavation to the depth and extent indicated on the drawings and specified herein. No adjustment in the contract sum will be made on account of the presence or absence of rock, shale, or other materials encountered in excavating.

C. Benchmarks and Monuments

1. Carefully maintain all benchmarks, monuments, and other reference points. If disturbed or destroyed, replace as directed.

D. Excavation:

1. Remove rock by using hand or power tools only. Blasting is not permitted unless authorized in writing by the Architect.
2. Any damage to existing structures, exterior services, or rock intended for bearing shall be corrected by the Contractor at their own expense.
3. Take necessary precautions to control runoff of eroded earth onto the property of others or against the structures. All such damage or any other damage incurred in the course of excavation, shall be corrected by the Contractor at their own expense.

- E. Trenching:
  - 1. Cut trenches neatly and uniformly. Work with extreme care near existing ducts, conduits, and other utilities to avoid damaging them.
  - 2. Width: Excavate trench a minimum of 3 inches wider than duct bank on each side with a minimum trench width of 12-inches.
  - 3. Depth: Excavate to a minimum depth that equals ductbank height plus minimum cover requirements.
  - 4. Hand excavate trench bottom to provide uniform bearing and support of conduits on an undisturbed subgrade matching slope requirement. Remove all debris, stones, and other projections.
    - a. For rock or other unyielding soils, excavate trenches 6-inches deeper than required elevation and provide level 6-inch compacted sand bedding course.
    - b. For unstable soils or where bedding course is subject to washout, provide concrete trench bottom.
  - 5. Coordinate protection of roots in tree and plant protection zones with Division 31 requirements.
  - 6. Keep trenches free from water while construction is in progress. Installation of conduit or cable in trenches with water is not permitted. Contractor is responsible for all costs associated with dewatering of trenches.
- F. Final Backfill: Comply with Division 31 and as indicated below:
  - 1. Use satisfactory soil to backfill trenches to final subgrade elevation unless required otherwise by Civil or Structural subgrade requirements.
  - 2. Install final backfill in 6-inch layers.
  - 3. Compact all backfill to 95% standard proctor density.
  - 4. Mechanical means for compaction can be used once conduits have been covered with at least 12-inches of hand tamped backfill. Do not use heavy-duty, hydraulic-operated, compaction equipment.
- G. Restoration:
  - 1. Replace area immediately after backfilling is completed or after construction in immediate area is complete.
  - 2. Restore all surface features at areas disturbed by excavation, storing of dirt, cable laying, and other work, and re-establish original grades unless otherwise indicated.
  - 3. Restore vegetation and include 6-inches of clean topsoil, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Division 32.
- H. Cut and patch existing pavement in the path of underground ducts and utility structures according to the "Cutting and Patching" requirements in Division 01 and Section 260010, "General Requirements for Electrical".

### 3.4 DUCT INSTALLATION

- A. Install ducts, spacers, and accessories into ductbank configurations to accommodate duct quantities and sizes indicated on drawings.
- B. Install ducts according to NEMA TCB 2.
- C. Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes, to drain in both directions. Install ducts in such a manner to avoid traps and insure against collection of moisture.

- D. Curves and Bends:
1. Use 5-degree angle couplings for small changes in direction.
  2. Use manufactured long sweep bends with a minimum radius of 36 inches vertically and 60-inches horizontally, unless otherwise indicated.
  3. Field manufactured bends are acceptable for a bend radius greater than 35-feet. Install field bends in accordance with NEMA TCB 2.
  4. Electrical duct and duct banks: Install no more than the equivalent of three 90-degree bends in any conduit run.
  5. Communications duct and duct banks: Install no more than the equivalent of two 90-degree bends in any conduit run and a maximum of 600 feet between pull points.
- E. Joints: Use solvent-cemented joints in non-metallic ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same horizontal or vertical plane to ensure encasement or backfill fully surrounds each raceway.
- F. Installation Adjacent to High-Temperature Steam Lines: Where duct banks are installed parallel to underground steam lines, provide minimum 6-foot separation or perform calculations showing the duct bank will not be subject to environmental temperatures above 40 deg C. Where environmental temperatures are calculated to rise above 40 deg C, and anywhere the duct bank crosses above an underground steam line, install insulation blankets listed for direct burial to isolate the duct bank from the steam line.
- G. Installation Adjacent to Other Utilities:
1. Provide minimum 12-inches of earth or 3-inches of concrete between power and communications ducts.
  2. Provide minimum 24-inches of earth between power or communications ducts and other parallel utilities. At utility crossings, provide minimum 6-inches of separation except provide 12-inches separation where crossing utility is gas or other line that transports flammable material.
  3. Do not locate power and communications ducts below water and sewer lines.
- H. Duct Entrances to Manholes and Concrete Handholes: Use end bells, spaced approximately 10 inches o.c. for 5-inch ducts, and vary proportionately for other duct sizes.
1. Begin change from regular spacing to end-bell spacing 10 feet (3 m) from the end bell without reducing duct line slope and without forming a trap in the line.
  2. Direct-Buried Duct Banks: Install an expansion and deflection fitting in each conduit in the area of disturbed earth adjacent to manhole or handhole. Install an expansion fitting near the center of all straight line direct-buried duct banks with calculated expansion of more than 3/4 inch (19 mm).
  3. Grout end bells into structure walls from both sides to provide watertight entrances.
- I. Building Penetrations: Make a transition from underground duct to GRC at least 10 feet outside the building wall, without reducing duct line slope away from the building and without forming a trap in the line. Use fittings manufactured for RNC-to-GRC transition. Provide sleeves at building penetration and make water-tight with sleeve seal.
- J. Duct Support
1. For concrete encased applications, support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.

2. Separator Installation: Space separators at a maximum of 5-feet to prevent sagging and deforming of ducts. Place spacers within 24-inches of duct ends. Stagger separators approximately 6 inches between tiers.
3. Minimum Space between Ducts: 3 inches between ducts and between ducts and exterior envelope wall.

K. Concrete-Encased Ducts:

1. Secure separators to earth and to ducts to prevent floating during encasement. Tie entire assembly together using non-ferrous tie-wires or straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
2. Reinforcement: Where indicated, reinforce concrete-encased duct banks for their entire length. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
3. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
4. Concrete Cover: Install a minimum of 3 inches of concrete cover between edge of duct and exterior envelope wall.
5. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.
  - a. Start at one end and finish at the other, allowing for expansion and contraction of ducts as their temperature changes during and after the pour. Use expansion fittings installed according to manufacturer's written recommendations or use other specific measures to prevent expansion-contraction damage.
  - b. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch reinforcing-rod dowels extending a minimum of 18 inches into concrete on both sides of joint near corners of envelope.
6. Concrete Encasement:
  - a. Use normal strength concrete, minimum 3000 psi at 28 days, 6-to-8-inch slump, with maximum 1/2 inch aggregate.
  - b. Comply with requirements in "Concrete Placement" Article in Division 03. Place concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope.
  - c. Do not allow a heavy mass of concrete to fall directly onto ducts. Allow concrete to flow to center of bank and rise up in middle, uniformly filling all open spaces.
  - d. Do not use power-driven agitating equipment unless specifically designed for duct-bank application.
7. Complete final backfilling after concrete has cured.

L. Direct-Buried Duct Banks:

1. Set elevation of bottom of duct bank below frost line.
2. After installing first tier of ducts, install initial backfill and compact.
3. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process.
4. Perform initial backfilling/encasement in 2-inch lifts. Compact to 95% standard proctor density.
5. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inches over ducts and hand tamp.
6. Firmly tamp initial backfill around ducts to provide maximum supporting strength. Use hand tamper only.
7. After placing initial backfill over final tier, make final duct connections at end of run and complete backfilling.

8. Initial backfill/encasement material shall be crushed stone, sand, or pea gravel with a maximum aggregate size of 1/2-inch.
- M. Warning Tape: Bury warning tape approximately 12 inches above all ducts. Align tape parallel to and within 3 inches of centerline of duct bank. Provide an additional warning tape for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional tapes 12 inches apart, horizontally.
- N. Install pull tape in all spare ducts with 3ft of slack tied off and secured at each pull point.
- O. Duct Sealing:
  1. Provide temporary plugs of all ducts upon completion of each portion of work to prevent ingress of foreign material into the duct.
  2. After conductors have been installed seal all ducts, including spare ducts, at building entrances and equipment terminations. Use sealing compound and foam plugs capable of withstanding at least 15-psig hydrostatic pressure.

### 3.5 INSTALLATION OF CONCRETE MANHOLES, HANDHOLES, AND BOXES

- A. Precast Concrete Handhole and Manhole Installation:
  1. Comply with ASTM C 891 unless otherwise indicated.
  2. Install units level and plumb and with orientation and depth coordinated with connecting ducts, to minimize bends and deflections required for proper entrances.
  3. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- B. Elevations:
  1. Manhole Roof: Install with rooftop at least 15 inches below finished grade.
  2. Manhole Frame: In paved areas and trafficways, set frames flush with finished grade. Set other manhole frames 1 inch above finished grade.
  3. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes 1 inch above finished grade.
- C. Where indicated, cast handhole cover frame integrally with handhole structure.
- D. Drainage: Provide 120V cord and plug connected sump pump complete with float switch, thermal overload protection, and GFCI receptacle mounted in NEMA 3R boxes in manhole. Provide dedicated 3/4-inch conduit and conductors to nearest electrical panelboard. Route discharge line to nearest storm sewer or daylight to swale with headwall.
- E. Lighting: Provide NEMA 3R light switch mounted no more than 2 feet from top of ladder and a 15W LED wet location light fixture in manhole. Provide dedicated 3/4-inch direct-buried conduit and conductors to nearest electrical panelboard.
- F. Manhole Access: Circular opening in manhole roof; sized to match cover size.
  1. Manholes with Fixed Ladders: Offset access opening from manhole centerlines to align with ladder.
  2. Install chimney, constructed of precast concrete collars and rings, to support cast-iron frame to connect cover with manhole roof opening. Provide moisture-tight masonry joints and waterproof grouting for frame to chimney.

- G. Waterproofing: Apply waterproofing to exterior surfaces of manholes and handholes after concrete has cured at least three days. After ducts have been connected and grouted, and before backfilling, waterproof joints, and connections, and touch up abrasions and scars. Waterproof exterior of manhole chimneys after mortar has cured at least three days.
- H. Hardware: Turn over removable hardware, including pulling eyes, cable stanchions, cable arms, to Construction Manager for use during next phase.
- I. Fixed Manhole Ladders: Arrange to provide for safe entry with maximum clearance from cables and other items in manholes.
- J. Field-Installed Bolting Anchors in Manholes and Concrete Handholes: Do not drill deeper than 3-7/8 inches (97 mm) for manholes and 2 inches (50 mm) for handholes, for anchor bolts installed in the field. Use a minimum of two anchors for each cable stanchion.

### 3.6 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

- A. Install hand-holes and boxes level and plumb and with orientation and depth coordinated with connecting ducts, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of ducts, and seal joint between box and extension as recommended by manufacturer.
- B. Unless otherwise indicated, support units on a 12-inch thick level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch above finished grade. Install handholes and boxes with bottom below frost line.
- D. Field cut openings for ducts and conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.
- E. For enclosures installed in asphalt paving, form and pour a concrete ring encircling, and in contact with, enclosure and with top surface screeded to top of box cover frame. Bottom of ring shall rest on compacted earth.
  - 1. Concrete: 3000 psi, 28-day strength, complying with Division 03, with a troweled finish.
  - 2. Dimensions: minimum 10 inches wide and 12 inches deep or as shown on drawings.

### 3.7 GROUNDING

- A. Comply with Section 260526 "Grounding and Bonding for Electrical Systems".
  - 1. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide #1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, non-shrink grout.



2. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with #4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

### 3.8 IDENTIFICATION

- A. Comply with Section 260553 "Identification for Electrical Systems"
  1. Where ducts transition through manholes or handholes, and at each termination point, provide each duct with a unique identifier to indicate origination point.
  2. Cover legends shall be consistent with the owner's standard practices, especially within existing facilities, unless otherwise require by codes.

### 3.9 FIELD QUALITY CONTROL

- A. Prior to covering duct or underground structures, perform visual inspections to verify the following:
  1. Proper installation depths and slopes have been maintained.
  2. Proper vertical and horizontal spacing in multi-duct formations.
  3. All conduit sections have been properly jointed.
  4. Proper bend radius of curved sections have been maintained.
  5. Check for damage at changes in grades or at bends.
- B. Perform the following tests and inspections and prepare test reports:
  1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
  2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for duct deflections or out of round conditions. Provide a minimum 6-inch- long mandrel 1/2-inch smaller in diameter than diameter of duct. If obstructions are discovered, remove obstructions and retest.
  3. Test manhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 260526 "Grounding and Bonding for Electrical Systems."
- C. Correct deficiencies, replace affected duct sections, and retest as specified above to demonstrate compliance.
- D. Prepare detailed test and inspection reports with accompanying digital photographs.
- E. Concealed Work Photographs: Before proceeding with installing backfill that will conceal work, take photographs sufficient in number, with annotated descriptions, to record nature and location of concealed Work.

3.10 CLEANING

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of all ducts until duct cleaner indicates that duct is clear of dirt and debris. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.
- B. Clean internal surfaces of manholes and handholes, including sump. Remove dirt and foreign material.

**END OF UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS**

## **SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS**

### **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions, Division 01 Specification Sections, and Section 260010 "General Requirements for Electrical Systems" apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Equipment Nameplates.
  - 2. Cable and Conductor Labels.
  - 3. Wiring Device Labels
  - 4. Safety Labels.
  - 5. Instruction Signs.
  - 6. Miscellaneous identification products.

#### 1.3 REFERENCES

- A. Abbreviations
- B. Definitions
  - 1. Emergency Systems: Those systems legally required and classed as emergency by NFPA 70 Article 700, municipal, state, other codes, or by any government agency having jurisdiction.
  - 2. Essential Electrical Systems: Those systems designed to ensure continuity of electrical power to designated areas and functions of a healthcare facility during disruption of normal power sources, and to minimize disruption within the internal wiring system.
- C. Reference Standards: The following publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest version as of the date of the Contract Documents, unless otherwise specified.
  - 1. American National Standards Institute (ANSI)
    - a. ANSI Z535.4, "Product Safety Signs and Labels"
  - 2. National Fire Protection Association (NFPA)
    - a. NFPA 70E, "Standard for Electrical Safety in the Workplace"
  - 3. Occupational Safety and Health Administration (OSHA)
    - a. 29 CFR 1910.144, "Safety color code for marking physical hazards"
    - b. 29 CFR 1910.145, "Specifications for accident prevention signs and tags"
  - 4. Underwriters Laboratories Inc (UL)
    - a. UL 969, "Marking and Labeling Systems"

#### 1.4 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
  - 1. Include project specific examples of each label type.
- B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.
- C. Closeout Submittal:
  - 1. In addition to items specified in Division 01 and Section 260010 "General Requirements for Electrical Systems", include the following:
    - a. Provide electronic Excel files of all panelboard directories to owner as part of Close-out Documentation.

#### 1.5 COORDINATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes and standards. Use consistent designations throughout Project.
- B. All identifications shall be consistent with the owner's standard practices, especially within existing facilities, unless otherwise require by codes. Where the requirements herein are in conflict, the contractor shall notify the engineer in writing prior to ordering any material.
- C. All room names and/or numbers for labeling or programming shall use the Owner's approved room name and numbering scheme, not names and numbers indicated on floor plans. All reprogramming shall be included as required to accommodate construction phasing.
- D. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- E. Coordinate installation of identifying devices with location of access panels and doors.
- F. Install identifying devices before installing acoustical ceilings and similar concealment.

### **PART 2 - PRODUCTS**

#### 2.1 EQUIPMENT SIGNS AND NAMEPLATES

- A. Engraved Plastic Signs and Nameplates.
  - 1. 3-layer melamine plastic laminate
  - 2. Weather and UV-resistant for Wet and Damp Locations.
  - 3. Thickness:
    - a. For signs up to 20 sq. in., minimum 1/16 inch thick.
    - b. For signs larger than 20 sq. in. or 8 inches in length, 1/8 inch thick.
    - c. Punched or drilled for mechanical fasteners with 1/4-inch grommets in corners for mounting.

- d. Framed with mitered melamine molding and arranged for attachment at applicable equipment.
- 4. Color: Comply with color legend.

## 2.2 RACEWAY AND CONDUCTOR LABELS

- A. Raceway Labels: Pre-printed, self-adhesive, polyester, suitable for indoor or outdoor use, resistant to abrasion, humidity, and weather.
  - 1. Color: Black Letters on an orange field.
  - 2. Size: For each raceway size, comply with ANSI/ASME A13.1 for recommended letter height and field length.
- B. Wire and Cable Labels: Machine printed, self-adhesive, polyester, self-laminating, suitable for indoor or outdoor use on flexible cables, resistant to abrasion, humidity, and weather.

## 2.3 SAFETY SIGNS AND LABELS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. All field-applied hazard markings shall warn of hazards using effective words, colors, symbols, or any combination thereof as recommended by ANSI Z535.4-2011. This applies to all instances where caution, warning, or danger signs are required per the NEC and applicable OSHA standards.
- C. Self-Adhesive Safety Labels: Polyester, Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for intended use and suitable for installed environment.
- D. Provide UV overlaminating film for outdoor locations.

## 2.4 INSTRUCTION SIGNS

- A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.
- B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

## 2.5 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Floor Marking Tape: 2-inch wide, 5-mil pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.
- B. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system suitable for surface material and location (exterior or interior).

- C. Fasteners for Labels and Signs:
  - 1. Self-tapping, stainless-steel screws, or stainless-steel machine screws with nuts and flat and lock washers.
  - 2. Pop-Rivets.
  - 3. Two-Part Epoxy Adhesive
  
- D. Cable Ties: Self-extinguishing, one-piece, self-locking, UV-stabilized or plenum rated where required by installed environmental conditions. 3/16-inch minimum width.

### **PART 3 - EXECUTION**

#### 3.1 GENERAL REQUIREMENTS

- A. Verify identity of each item before installing identification products.
- B. Before installation of labels, clean all surfaces using materials and methods recommended by manufacturer of identification device.
- C. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
- D. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- E. Install all labels in a neat manner, plumb and parallel to equipment lines.
- F. Attach plastic signs and labels to equipment with mechanical fasteners appropriate to the location and substrate. Where screws cannot or should not penetrate substrate use two-part epoxy adhesive listed for use with intended substrate and environmental conditions.
- G. Handwritten, non-permanent, or stenciled labels are not permitted unless noted otherwise.
- H. For surfaces that require finish work, apply identification devices to surfaces after completing finish work.
- I. Identification shall consist of all UPPER-CASE LETTERS.
- J. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

#### 3.2 EQUIPMENT IDENTIFICATION

- A. Provide all new and modified equipment with a nameplate consisting of 1/2" letters for equipment designation and 1/4" letters for voltage, source, and feeder information. This includes but is not limited to panelboards, switchboards, switchgear, disconnect switches, transformers, power transfer equipment, generators, motor starters, variable frequency drives, lighting control panels, contactors, cabinets, push button stations, and auxiliary system control panels.

- B. Distribution equipment labels shall indicate the following:
  - 1. Equipment designation.
  - 2. Voltage system.
  - 3. Equipment ampacity.
  - 4. Source equipment designation and location.
  - 5. Feeder size.
  
- C. Transformer labels shall indicate the following:
  - 1. Equipment designation.
  - 2. Primary voltage system and primary feeder ampacity.
  - 3. Source equipment designation and location.
  - 4. Primary feeder size.
  - 5. Secondary voltage system and load equipment designation
  
- D. Equipment disconnect labels shall indicate the following:
  - 1. Equipment designation.
  - 2. Voltage system and feeder ampacity
  - 3. Source equipment designation and location.
  
- E. Locate equipment nameplates at center of top of trim for branch circuit panels, switchgear, and centered at side for branch circuit switches.
  
- F. Where equipment is provided with a factory installed disconnecting means or motor controller, install label on factory provided unit.
  
- G. For equipment with multiple power sources, such as transfer switches and control panels, identify each source and its function.
  
- H. Color Legend
  - 1. Normal Power Systems: Black field with white letters
  - 2. Emergency Power Systems (As defined by NEC Article 700): Red field with white letters.
  
- I. Where electrical distribution equipment, including panelboards, switchboards, and switchgear, are connected to an emergency source, the nameplate shall incorporate the word "EMERGENCY" into the legend. Refer to drawings for further details.
  
- J. Where the premise wiring system has feeders and/or branch circuits supplied from more than one nominal voltage system, provide sign at each switchgear, switchboard, and panelboard displaying color coded identification method for each ungrounded, grounded, and equipment grounding conductor.
  
- K. Service Equipment and Building Feeder, Branch Circuit Disconnects.
  - 1. Provide label for service disconnecting means to permanently identify it as the "SERVICE DISCONNECT".
  - 2. Where a building or structure has any combination of feeders, branch circuits, or services passing through it or supplying it, provide a permanent sign at each disconnect location identifying all other feeders, branch circuits, or services and the area served by each.

### 3.3 IDENTIFICATION OF CONDUCTORS

- A. Service, Feeder, and Branch-Circuit Conductors: Refer to Section 260519, "Low Voltage Electrical Power Conductors and Cables" for conductor and cable color coding requirements.

- B. Indicate source and circuit number of conductors to be extended in the future.
- C. Auxiliary Systems Alarm, Signal, and Control Wire Identification: At termination points, identify each conductor by its system, designation, and function.

### 3.4 IDENTIFICATION OF RACEWAYS AND BOXES

- A. Identify all junction, outlet, device, and pull boxes with wiring system, voltage, and circuit designations of conductors.
  - 1. In concealed locations above accessible ceilings and in exposed unfinished areas such as data, mechanical, or electrical rooms, provide designations on outside of box covers.
  - 2. For exposed boxes in finished areas, provide designations on inside of box covers.
  - 3. System Legend shall be as follows:
    - a. Power
    - b. Emergency
    - c. UPS
- B. The inside of all junction and backboxes shall be marked with panel and circuit number in permanent marker.
- C. All empty conduit runs and conduit with conductors for future use shall be identified for use and shall indicate where they terminate.

### 3.5 IDENTIFICATION OF WIRING DEVICES

- A. All new and existing receptacle cover plates in area of work shall be marked with their panel and circuit number(s) with clear, machine printed adhesive labels with black lettering.

### 3.6 PANELBOARD CIRCUIT DIRECTORIES

- A. For Distribution Panelboards, Switchboards, and Switchgear, provide nameplates at each switch or circuit breaker to indicate load designation.
- B. Provide clearly legible typewritten directories in each electrical panel indicating the area, item of equipment, etc. controlled by each switch, breaker, fuse, etc. These directories are to be inserted into plastic cardholders on back door in each panel. Descriptions shall identify each circuit as to its clear, evident, and specific purpose or use. The identification shall include an approved degree of detail that allows each circuit to be distinguished from all others. Spaces and Spare positions shall be described accordingly.
  - 1. At a minimum, provide the following panel information for each panel directory:
    - a. Panel name
    - b. Panel bus rating
    - c. Voltage System
    - d. Mains Configuration and Rating
    - e. Short Circuit Current Rating
  - 2. Circuit Designation Examples:
    - a. LIGHTS, ROOM 100
    - b. FLOOR RECEPTACLES, ROOM 200
    - c. ERV-1 RECEPTACLE, ROOF



- C. Panel Schedules and circuit numbers on Record Drawings shall match.
- D. Any existing panels which are affected by this contractor's work shall also be provided with new typewritten directories.

### 3.7 SAFETY SIGNS

- A. Install Warning, Caution, and Danger signs in accordance with NFPA 70 and OSHA requirements to ensure safe operation of electrical equipment and the items to which they connect.
- B. Comply with 29 CFR 1910.145 and ANSI Z535.4.
- C. Apply to exterior of door, cover, or other access point.
- D. Labels and signs shall include, but are not limited to, the following legends:
  - 1. Identify system voltage with black letters on an orange background.
  - 2. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
  - 3. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES"
  - 4. Where series combination ratings are allowed: "CAUTION - SERIES COMBINATION SYSTEM RATED \_\_\_\_ AMPERES. IDENTIFIED REPLACEMENT COMPONENTS REQUIRED."

### 3.8 INSTRUCTION SIGNS

- A. Operating Instruction Signs: Install instruction signs with minimum 3/8-inch letters to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation, power transfer, and load shedding.

### 3.9 WORKSPACE INDICATION

- A. Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install flush-mounted panelboards and similar equipment in finished spaces.

### 3.10 IDENTIFICATION FOR EQUIPMENT AND RACEWAYS RATED MORE THAN 600V

- A. Provide warning signs for the enclosures of electrical equipment including pad-mounted transformers, pad-mounted switches, and switchgear having a nominal rating exceeding 600 volts.
  - 1. When the enclosure integrity of such equipment is specified to be in accordance with IEEE C57.12.28 or IEEE C57.12.29, such as for pad-mounted transformers, provide self-adhesive warning signs on the outside of the high voltage compartment door(s). Sign shall have nominal dimensions of 7 by 10 inches with the legend "DANGER HIGH VOLTAGE" printed in two lines of nominal 2-inch-high letters. The word "DANGER" shall

- be in white letters on a red background and the words "HIGH VOLTAGE" shall be in black letters on a white background.
2. When such equipment is guarded by a fence, mount signs on the fence. Provide metal signs having nominal dimensions of 14 by 10 inches with the legend "DANGER HIGH VOLTAGE KEEP OUT" printed in three lines of nominal 3-inch-high white letters on a red and black field.
- B. Concealed Raceways, Duct Banks, More Than 600 V, within Buildings: Tape and stencil 4-inch-wide black stripes on 10-inch centers over orange background that extends full length of raceway or duct and is 12 inches wide. Stencil legend "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch-high black letters on 20-inch centers. Stop stripes at legends. Apply to the following finished surfaces:
1. Floor surface directly above conduits running beneath and within 12 inches of a floor that is in contact with earth or is framed above unexcavated space.
  2. Wall surfaces directly external to raceways concealed within wall.
  3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in the building, or concealed above suspended ceilings.
- C. Accessible Raceways, More Than 600 V: Self-adhesive vinyl labels. Install labels at 10-foot maximum intervals.

**END OF IDENTIFICATION FOR ELECTRICAL SYSTEMS**

## **SECTION 26 27 26 - WIRING DEVICES**

### **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions, Division 01 Specification Sections, and Section 260010 "General Requirements for Electrical Systems" apply to this Section.

#### 1.2 SUMMARY

- A. This section of the specifications covers all wiring devices and cover plates, standard, weatherproof and dust-tight.
- B. Section Includes:
  - 1. Straight Blade receptacles.
  - 2. GFCI receptacles.
  - 3. AFCI receptacles.
  - 4. USB receptacles.
  - 5. SPD receptacles.
  - 6. Twist-locking receptacles.
  - 7. Controlled receptacles.
  - 8. General use snap switches.
  - 9. Manual Motor Control switches.
  - 10. Wall Plates.
  - 11. Cord and plug sets.
  - 12. Floor service fittings.
  - 13. Poke-through assemblies.
  - 14. Prefabricated multioutlet assemblies.
  - 15. Service poles.
  - 16. Cord Reels.

#### 1.3 REFERENCES

- A. Abbreviations
  - 1. AFCI: Arc-fault circuit interrupter.
  - 2. CR: Corrosion Resistant
  - 3. EMI: Electromagnetic interference.
  - 4. GFCI: Ground-fault circuit interrupter.
  - 5. IG: Isolated Ground
  - 6. SPD: Surge Protective Device
  - 7. TR: Tamper Resistant.
  - 8. USB: Universal Serial Bus.
  - 9. WR: Weather Resistant.

B. Definitions

1. Emergency Electrical Systems: Those systems legally required and classed as emergency by NFPA 70 Article 700, municipal, state, other codes, or by any government agency having jurisdiction.
2. Essential Electrical Systems: Those systems designed to ensure continuity of electrical power to designated areas and functions of a healthcare facility during disruption of normal power sources, and also to minimize disruption within the internal wiring system as defined by NFPA 70 Article 517 and NFPA 99.
3. Outlet: A point on the wiring system at which current is taken to supply utilization equipment.
4. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
5. Receptacle. A receptacle is a contact device installed at the outlet for the connection of an attachment plug. A single receptacle is a single contact device with no other contact device on the same yoke. A multiple receptacle is two or more contact devices on the same yoke.

C. Reference Standards: The following publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest version as of the date of the Contract Documents, unless otherwise specified.

1. National Electrical Contractors Association (NECA):
  - a. NECA 130, "Standard for Installing and Maintaining Wiring Devices"
2. National Electrical Manufacturers Association (NEMA)
  - a. NEMA WD 1, "General Color Requirements for Wiring Devices"
  - b. NEMA WD 6, "Wiring Devices—Dimensional Specifications"

1.4 SUBMITTALS

- A. Product Data: For each type of product.
- B. Schedules: List of legends and description of materials and process used for pre-marking wall plates.
- C. Samples: Where requested by architect or engineer, one for each type of device and wall plate, in each color specified.
- D. Closeout Submittals
  1. Operation and Maintenance Data: For Wiring Devices to include in operation and maintenance manuals.
  2. In addition to items specified in Division 01 and Section 260010 "General Requirements for Electrical Systems", include the following:
    - a. Manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

## **PART 2 - PRODUCTS**

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide product indicated or equal from one of the following:
  - 1. Eaton/Arrow Hart
  - 2. Hubbell
  - 3. Leviton
  - 4. Pass & Seymour/Legrand
- B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

### 2.2 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.
- C. RoHS compliant.
- D. Devices for Fixtures, Furnishings, and Equipment:
  - 1. Receptacles: Match plug configurations.
  - 2. Cord and Plug Sets: Match equipment requirements.
- E. All terminations shall be side-wired clamping type. "Backstab" terminations or modular connectors are not permitted.
- F. Device Color:
  - 1. Wiring devices in finished spaces connected to normal power system: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
  - 2. Wiring Devices in unfinished spaces connected to normal power system: Grey unless otherwise indicated or required by NFPA 70 or device listing.
  - 3. Wiring Devices Connected to Emergency or Essential Electrical System: Red.
  - 4. SPD Devices: Blue.
  - 5. Isolated-Ground Receptacles: Orange or as specified above with orange triangle on face.
- G. Wall Plate Color:
  - 1. For plastic covers, match device color unless noted otherwise.
  - 2. Where normal and essential system devices are ganged under a common wall plate, the plate shall be the color of normal power plates.

### 2.3 SPECIFICATION GRADE STRAIGHT-BLADE RECEPTACLES

- A. Specification Grade Receptacle, Comply with NEMA WD 6, UL 498, FS W-C-596.

TYPE	RATING	CONFIGURATION	BASIS OF DESIGN
Duplex	20A, 125V	NEMA 5-20R	Hubbell 5362
Single	20A, 125V	NEMA 5-20R	Hubbell 5361
Duplex-TR	20A, 125V	NEMA 5-20R	Hubbell 5362TR
Duplex-IG	20A, 125V	NEMA 5-20R	Hubbell IG5362
Duplex-WR	20A, 125V	NEMA 5-20R	Hubbell 5362WR
Duplex-CR	20A, 125V	NEMA 5-20R	Hubbell HBL53CM62
Single	30A, 250V	NEMA 6-30R	Hubbell HBL9330
Single	50A, 250V	NEMA 6-50R	Hubbell HBL9367
Single	20A, 250V	NEMA 10-20R	Hubbell HBL9326

#### 2.4 SPECIFICATION GRADE GFCI RECEPTACLES

- A. Specification Grade GFCI Receptacles, Comply with UL 498, FS W-C-596, and UL 943 Class A.
- B. Non-feed through type unless otherwise required, Integral self-testing GFCI with "Test" and "Reset" buttons and LED indicator light that is lighted when the unit is tripped. If critical components are damaged and ground fault protection is lost, power to receptacle shall be discontinued.

TYPE	RATING	CONFIGURATION	BASIS OF DESIGN
Duplex GFCI	20A, 125V	NEMA 5-20R	Hubbell GFRST20
Duplex GFCI with Alarm	20A, 125V	NEMA 5-20R	Hubbell GFRST20A
Duplex GFCI - TR	20A, 125V	NEMA 5-20R	Hubbell GFTRST20
Duplex GFCI - WR	20A, 125V	NEMA 5-20R	Hubbell GFTWRST20
Duplex GFCI - CR	20A, 125V	NEMA 5-20R	Hubbell GFRST52M
GFCI Blank Face	20A, 125V		Hubbell GFBFST20

#### 2.5 SPECIFICATION GRADE AFCI RECEPTACLES

- A. Specification Grade AFCI Receptacles, Comply with UL 498, FS W-C-596, and UL 1699A.

- B. Non-feed through type unless otherwise required, Integral self-testing AFCI with "Test" and "Reset" buttons and LED indicator light that is lighted when the unit is tripped. If critical components are damaged and ground fault protection is lost, power to receptacle shall be discontinued.

TYPE	RATING	CONFIGURATION	BASIS OF DESIGN
Duplex AFCI - TR	20A, 125V	NEMA 5-20R	Hubbell AFR20TR
Duplex AFCI/GFCI -TR	20A, 125V	NEMA 5-20R	Hubbell AFGF20TR
AFCI Blank Face	20A, 125V		Hubbell AFR20BF

2.6 USB RECEPTACLES

- A. USB Charging Receptacle and Outlet, Comply with UL 1310 and USB 3.0 devices.
- B. Dual port, combination USB Type A and C, 5 V dc, and 5 A per receptacle (minimum).

TYPE	RATING	CONFIGURATION	BASIS OF DESIGN
Duplex USB - TR	20A, 125V	NEMA 5-20R	Hubbell USB20AC5
Duplex USB - WR	20A, 125V	NEMA 5-20R	Hubbell USB20AC5WR

2.7 SPECIFICATION GRADE SPD RECEPTACLES

- A. Specification Grade SPD Receptacles, Comply with UL 498, FS W-C-596, and UL 1449, Type 3:
- B. Self-grounding. Integral SPD in line to ground, line to neutral, and neutral to ground. Visual and audible SPD indication, with LED indicator light visible in face of device to indicate device is "active" or "no longer in service."
- C. SPD Components: Multiple metal-oxide varistors; with a nominal clamp-level rating of 500 V and minimum single transient pulse energy dissipation of 340 J in each mode, according to IEEE C62.41.2 and IEEE C62.45.

TYPE	RATING	CONFIGURATION	BASIS OF DESIGN
Duplex SPD	20A, 125V	NEMA 5-20R	Hubbell HBL5362SA

2.8 HOSPITAL-GRADE RECEPTACLES

- A. Hospital-Grade Receptacles, Comply with requirements above and UL 498 Supplement SD:
- B. Marking: Listed and labeled as complying with NFPA 70, Article 517 "Health Care Facilities".

TYPE	RATING	CONFIGURATION	BASIS OF DESIGN
Duplex	20A, 125V	NEMA 5-20R	Hubbell HBL8300H
Single	20A, 125V	NEMA 5-20R	Hubbell HBL8310
Duplex - TR	20A, 125V	NEMA 5-20R	Hubbell 8300TRA
Duplex - IG	20A, 125V	NEMA 5-20R	Hubbell IG8300
Duplex GFCI	20A, 125V	NEMA 5-20R	Hubbell GFRST83
Duplex GFCI - TR	20A, 125V	NEMA 5-20R	Hubbell GFTRST83
Duplex USB	20A, 125V	NEMA 5-20R	Hubbell USB8300AC5
Duplex SPD	20A, 125V	NEMA 5-20R	Hubbell 8362

## 2.9 TWIST-LOCKING RECEPTACLES

- A. Twist-Lock, Single Receptacles, with matching plug as required by equipment. Comply with NEMA WD 6, UL 498, FS W-C-596.

TYPE	RATING	CONFIGURATION	BASIS OF DESIGN
Single	20A, 125V	NEMA L5-20R	Hubbell HBL2310
Single	20A, 250V	NEMA L6-20R	Hubbell HBL2320
Single	20A, 277V	NEMA L7-20R	Hubbell HBL2330

## 2.10 CONTROLLED RECEPTACLES

- A. Specification Grade Receptacle, Permanently marked and suitable for use with automatic switching means. Comply with NEMA WD 6, UL 498B, FS W-C-596.

TYPE	RATING	CONFIGURATION	BASIS OF DESIGN
Duplex Single Face Control	20A, 125V	NEMA 5-20R	Hubbell 5362C1TR
Duplex Two Face Control	20A, 125V	NEMA 5-20R	Hubbell 5361C2TR

## 2.11 GENERAL USE SNAP SWITCHES

- A. Switches, 120/277 V, Comply with UL 20 and FS W-S-896.



TYPE	RATING	CONFIGURATION	BASIS OF DESIGN
Single Pole	20A, 120/277V		Hubbell 1221
Double Pole	20A, 120/277V		Hubbell 1222
Three Way	20A, 120/277V		Hubbell 1223
Four Way	20A, 120/277V		Hubbell 1224

B. Pilot-Light Switches, illuminated when switch is ON:

TYPE	RATING	CONFIGURATION	BASIS OF DESIGN
Single Pole	20A, 120/277V		Hubbell 1221PL

C. Illuminated Switches, illuminated when switch is OFF:

TYPE	RATING	CONFIGURATION	BASIS OF DESIGN
Single Pole	20A, 120/277V		Hubbell 1221IL

D. Key-Operated Switches, Factory-supplied key in lieu of switch handle:

TYPE	RATING	CONFIGURATION	BASIS OF DESIGN
Single Pole	20A, 120/277V		Hubbell 1221L
Three Way	20A, 120/277V		Hubbell 1223L
Four Way	20A, 120/277V		Hubbell 1224L

E. Double-Throw, Momentary-Contact, Center-off Switches.

TYPE	RATING	CONFIGURATION	BASIS OF DESIGN
Single Pole	20A, 120/277V		Hubbell 1557
Low Voltage	5A, 24VDC		Hubbell 1557LV

## 2.12 MANUAL MOTOR CONTROL SWITCHES

- A. Motor-Starting Switches (MSS): "Quick-make, quick-break" toggle type for manual control of single or three phase motors up to 3/4 HP where overload protection is not required or is provided separately, marked to indicate whether unit is on or off.
- Standard: Comply with NEMA ICS 2, general purpose, Class A.

- B. Fractional Horsepower Manual Controllers (FHPMC): "Quick-make, quick-break" toggle type with integral overload protection for use with single phase motors up to 1HP; marked to show whether unit is off, on, or tripped.
  - 1. Configuration: Non-reversing unless noted otherwise on drawings.
  - 2. Overload Relays: Inverse-time-current characteristics; NEMA ICS 2, Class 10 tripping characteristics; heaters matched to nameplate full-load current of actual protected motor and ambient temperature; external reset push button; melting alloy type.
  - 3. Red pilot light where indicated on drawings.
  - 4. HOA selector switch with dry contact inputs where indicated on drawings.
- C. Provide with NEMA 1, NEMA 3R or other enclosure suitable for the location and atmosphere.
- D. All manual starters located in finished areas shall be in flush-mounted enclosures.

### 2.13 PENDANT CORD-CONNECTOR DEVICES

- A. Description: Matching, locking-type plug and receptacle body connector, heavy-duty grade.
- B. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.
- C. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

### 2.14 CORD AND PLUG SETS

- A. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
- B. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
- C. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

### 2.15 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
  - 1. Plate-Securing Screws: Metal with head color to match plate finish.
  - 2. Material for Finished Spaces: Smooth, 0.060-inch high-impact thermoplastic or satin-finished, type 304 stainless steel.
  - 3. Material for Unfinished Spaces: Aluminum or type 430 stainless steel.
  - 4. Material for rough service or corrosive locations including gymnasiums, kitchens, mechanical rooms, material management, and food service areas: satin-finished, Type 304 stainless steel.
    - a. For kitchen and food service areas, provide foam gasket behind plate to help prevent water infiltration.
- B. Material for Interior Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

- C. Wet-location, Weatherproof, in-use cover plates: extra duty, suitable for use with and decorator style devices, die-cast aluminum lockable cover, self-closing, gasketed, standard box mounting.
  - 1. Vertical mounting - Hubbell WP26E or equal.
  - 2. Horizontal mounting - Hubbell WP26EH or equal.
- D. Cover plates for lighting control devices exposed to severe physical damage: Low profile, flip-up clear polycarbonate cover. STI Stopper or equal.

## 2.16 FLOOR BOXES AND POKE-THROUGH ASSEMBLIES

- A. Description: Single or multi-service, recess activated, multi-gang floor outlet with devices capable of supplying combinations of power, data, voice, and AV services in a single assembly.
- B. Manufacturers: Subject to compliance with requirements, provide product indicated on drawings or approved equal by one of the following:
  - 1. FSR
  - 2. Hubbell
  - 3. Legrand (Wiremold)
- C. Floor Boxes and Poke-Thru Assemblies
  - 1. Comply with UL514A.
  - 2. Material: Cast metal or sheet metal with finished interior
  - 3. Type: Fully adjustable before and after floor installation.
  - 4. Shape: Rectangular or Round
  - 5. Designed for use with industry standard wall plates, devices, and modular inserts.
  - 6. Painted with corrosion resistant fusion-bonded epoxy where used in on-grade floor applications.
  - 7. Classified for fire resistance up to 2 hours where used in rated floors.
  - 8. Evaluated by UL to meet U.S. safety standards for scrub water exclusion.
  - 9. Provide separate paths for management of telecommunications and power cables in compliance with NFPA 76.
  - 10. Cover: ADA-compliant, with less than 0.15-inch rise to cover flange, hinged for 180-degree opening, Gasketed, Die-cast powder coated aluminum suitable for multiple floor surfaces.
    - a. Surface style for carpet and VCT floor finishes.
    - b. Flush style for wood, tile, finished concrete, and terrazzo floor finishes.

## 2.17 PREFABRICATED MULTIOUTLET ASSEMBLIES

- A. Description: Two-piece surface metal raceway, with factory-wired multioutlet harness.
- B. Components shall be products from single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.
- C. Raceway Material: Metal, with manufacturer's standard finish.
- D. Multioutlet Harness:
  - 1. Receptacles: 20-A, 125-V.
  - 2. Receptacle Spacing: 18 inches unless noted otherwise.
  - 3. Wiring: No. 12 AWG solid, Type THHN copper.

## 2.18 SERVICE POLES

- A. Dual-Channel Service Poles
  1. Description: Factory-assembled and -wired units to route power and communications cabling from connections above ceiling to outlets below ceiling.
  2. Listed and labeled in accordance with UL 5 for exposed power raceway and fittings, and UL 2024 for communications raceway and fittings.
  3. Poles: Minimum 2.5-inch- square cross-section, with height adequate to extend from floor to at least 6 inches above ceiling, and with separate channels for power wiring and voice and data communication cabling.
  4. Mounting: Ceiling trim flange with concealed bracing arranged for positive connection to ceiling supports; with pole foot and carpet pad attachment.
  5. Material: Aluminum.
  6. Finishes: Manufacturer's standard painted finish and trim combination.
  7. Wiring: Sized for minimum of five No. 12 AWG power and ground conductors and a minimum of four, balanced twisted pair data communication cables.

## 2.19 CORD REELS

- A. Description: Reel equipped with, or intended for use with, length of flexible cord, providing means for cord to be unwound by user as desired, providing spring take-up mechanism to rewind cord on reel, and providing latch to restrain action of spring take-up mechanism while cord reel is in use.
- B. Comply with UL 355.
- C. Spring Driven, suitable for industrial and commercial use, No. 12 AWG conductors, 20A rating, Black aluminum housing, Ball stop, pivot base, 40ft spool capacity with double 20A duplex receptacles unless noted otherwise.

## **PART 3 - EXECUTION**

### 3.1 APPLICATION

- A. Provide receptacles and cover plates listed for the installed environment.
- B. Outdoor receptacles and receptacles located in wet locations shall be weather resistant, GFCI type, with weather proof enclosure.
- C. Provide GFCI receptacles where required by the NEC in addition to the locations noted on the drawings.
- D. Provide weather-resistant rating for GFCI receptacles installed in wet locations.
- E. Where GFCI receptacles are located in areas that are not readily accessible, provide GFCI blank face device in readily accessible location approved by Architect.
- F. Provide GFCI receptacles with audible alarm for refrigeration and vending applications.
- G. Provide tamper resistant receptacles where required by the NEC in addition to the locations noted on the drawings.

### 3.2 INSTALLATION

- A. Unless more stringent requirements are specified in Contract Documents or manufacturers' instructions, comply with installation instructions in NECA 130.
- B. Mounting Heights: Unless otherwise indicated in Contract Documents, comply with mounting heights recommended in NECA NEIS 1.
- C. Devices that have been installed before painting shall be masked. No plates or covers shall be installed until all finishing and cleaning has been completed. Replace stained or improperly painted wiring devices and coverplates.
- D. Install non-feed-through GFCI receptacles where protection of downstream receptacles is not required. Where GFCI receptacles share a single circuit with other devices, a ground fault on any GFCI receptacle shall not interrupt power to downstream devices.
- E. Coordination for all receptacles: Confirm receptacle configuration of all special purpose receptacles with approved submittals prior to installation and provide devices to match equipment plugs. Contractor shall replace any incompatible receptacle discovered during owner move-in.
- F. Coordination with Other Trades:
  - 1. Adjust locations of outlets to suit arrangement of partitions and furnishings. Locate outlets to avoid blocking by supports, furnishings, and other architectural fixtures.
  - 2. Adjust locations of floor boxes and poke-throughs to coordinate with locations of structural members, concealed piping, and concealed conduit.
  - 3. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
  - 4. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
  - 5. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
  - 6. Install wiring devices after all wall preparation, including painting, is complete.
- G. Conductors:
  - 1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
  - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
  - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
  - 4. Where re-using existing conductors:
    - a. Cut back and pigtail, or replace all damaged conductors.
    - b. Straighten conductors that remain and remove corrosion and foreign matter.
    - c. Pigtailling existing conductors is permitted, provided the outlet box is large enough.
- H. Device Installation:
  - 1. Replace all devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
  - 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.

3. Do not remove surface protection, such as plastic film and smudge covers, until all finish work is complete.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. Use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than #12 AWG are installed on 15- or 20-A circuits, splice #12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
10. Install devices and assemblies level, plumb, and square with building lines. Align devices vertically and horizontally. Securely fasten devices into boxes.

I. Device Orientation:

1. Install switches with "OFF" position down.
2. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the left so the neutral blade is at the top.

J. Device Plates:

1. Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
2. All outlets not provided with wiring devices shall be closed with a blank plate matching other plates in the area.
3. Align coverplate mounting screw slots in the same direction, either vertical or horizontal. Do not overtighten coverplate mounting screws. Overtightening can cause the coverplate to warp, dimple, bend, and in the case of plastic faceplates, crack or break.

### 3.3 IDENTIFICATION:

A. Comply with Section 260553 "Identification for Electrical Systems."

1. All device wall plates shall be labeled with panel and circuit designation by means of machine printed adhesive tape. Select face plates shall be engraved. Refer to drawings.
2. All device boxes shall have circuit number identified within the box.

### 3.4 FIELD QUALITY CONTROL

A. Test Instruments: Use instruments that comply with UL 1436.

B. Using a test plug, perform the following tests and inspections for receptacles:

1. Insert and remove test plug to verify that devices are securely mounted.
2. Verify correct configuration of hot, neutral, and ground pins.
3. Verify correct operation of ground fault protective devices.

C. Nonconforming Work:

1. Device will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

- D. Prepare test and inspection reports.

**END OF WIRING DEVICES**

## **SECTION 26 28 16 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS**

### **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions, Division 01 Specification Sections, and Section 260010 "General Requirements for Electrical Systems" apply to this Section.

#### 1.2 SUMMARY

- A. Description: Section includes requirements for the provision of individually enclosed switches and circuit breakers including manufacturing, fabrication, configuration and installation as required for the complete performance of the Work, as shown on the drawings and specifications
- B. Section includes:
  - 1. Fusible and Non-Fusible Switches.
  - 2. Enclosed Circuit Breakers.
  - 3. Elevator Shunt Trip Switches.
  - 4. Enclosures.

#### 1.3 REFERENCES

- A. Abbreviations
  - 1. HD: Heavy Duty
  - 2. MCCB: Molded Case Circuit Breaker
  - 3. NC: Normally Closed
  - 4. NO: Normally Open
  - 5. SCCR: Short Circuit Current Rating
- B. Definitions
  - 1. Disconnect: A switch, device, group of devices, or other means used to disconnect conductors of a circuit from their source of supply.
  - 2. Switch (switching device): A device, manually operated, unless otherwise designated, for opening and closing or for changing the connection of a circuit. Also referred to as safety switches or disconnect switches.

#### 1.4 SUBMITTALS

- A. Product Data: For each product type.
  - 1. Enclosure types and details for types other than NEMA 250, Type 1.
  - 2. Short-circuit current ratings (interrupting and withstand, as appropriate).
  - 3. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.



- B. Shop Drawings: For each type of enclosed switch, circuit breaker, accessory, and component indicated.
  - 1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
  - 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
  - 3. Detail bus configuration, current, and voltage ratings.
  - 4. Short-circuit current rating of overcurrent protective devices.
  - 5. Include evidence of NRTL listing for series rating of installed devices.
  - 6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
  - 7. Include wiring diagrams for power, signal, and control wiring.
  - 8. Cable terminal size and quantity.
  
- C. Closeout Submittals
  - 1. Operation and Maintenance Data: For enclosed switches and circuit breakers include in emergency, operation, and maintenance manuals.
  - 2. In addition to items specified in Division 01 and Section 260010 "General Requirements for Electrical Systems", include the following:
    - a. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

## 1.5 COORDINATION

- A. Product Selection for Restricted Space: Drawings indicate space available for enclosed switches including clearances between enclosed switches and adjacent surfaces and other items. Furnish and install equipment to comply with NEC clearances.

## 1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace devices that fail in materials or workmanship within 12 months from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. ABB/General Electric.
  - 2. Eaton Electrical Inc.
  - 3. Siemens.
  - 4. Square D
  
- B. Source Limitations: Obtain enclosed switches, overcurrent protection devices, and all other electrical distribution equipment through one source from a single manufacturer unless approved otherwise.

## 2.2 GENERAL REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.
- C. Service-Rated Switches and Circuit Breakers: Labeled for use as service equipment.
- D. Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Switch and overcurrent protective device short circuit ratings shall be at least 110% of the actual available fault current.

## 2.3 FUSIBLE AND NON-FUSIBLE SWITCHES

- A. Type HD, Heavy Duty, Single Throw, 250-VAC or 600-VAC, 1200 A and Smaller unless noted otherwise.
- B. Quick-make, quick-break operating handle and switch mechanism integral to box.
- C. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate fuses where indicated.
- D. Externally operable dual interlocked handle to prevent opening front cover with switch in ON position, or closing switch when door is open. Visible load interrupter knife switch blades in the off position with door open.
- E. Lockable handle with capability to accept three padlocks and interlocked with cover in closed position.
- F. All current carrying parts shall be plated by an electrolytic process to resist corrosion and to promote cooling.
- G. Accessories:
  - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  - 3. Lugs: UL Listed, mechanical type, front removeable, and suitable for number, size, and conductor material at 75 deg C.
  - 4. Auxiliary Contact Kit: NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open. Contact rating as required for application.
  - 5. Electrical Interlock Kit: Pivot arm operated from the switch mechanism, breaking a control circuit before the main switch blades break.
- H. For receptacle switches provide interlocking linkage between the receptacle and switch mechanism to prevent inserting or removing plug while switch is in the on position, inserting any plug other than specified, and turning switch on if an incorrect plug is inserted or correct plug has not been fully inserted into the receptacle.

## 2.4 ENCLOSED MOLDED-CASE CIRCUIT BREAKERS

- A. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- B. Circuit breakers shall be constructed using glass-reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.
- C. Circuit breakers shall have a toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. The circuit-breaker handle shall be over center, be trip free, and reside in a tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon shall be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit-breaker tripping mechanism for maintenance and testing purposes.
- D. MCCBs shall be equipped with a device for locking in the open position.
- E. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- F. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
  - 1. Long-time, Short-time, and Instantaneous trip unless noted otherwise on drawings.
- G. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.
- H. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single-, two-pole, and three-pole configurations with Class A ground-fault protection (6-mA trip).
- I. Ground-Fault Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).
- J. Features and Accessories:
  - 1. Standard frame sizes, trip ratings, and number of poles.
  - 2. Lugs: UL Listed, mechanical type, suitable for number, size, trip ratings, and conductor material at 75 deg C.
  - 3. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
  - 4. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact. Coordinate coil voltage and provide control circuits as required for application.

## 2.5 ELEVATOR SHUNT TRIP SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Bussmann
  - 2. Eaton

3. Littlefuse
  4. Mersen
- B. General Requirements: Comply with ASME A17.1, UL 50, and UL 98, with Class J fuse block and 200-kA interrupting and short-circuit current rating.
- C. Type HD, Heavy-Duty, Three Pole, Single-Throw Fusible Switch; UL 98 and NEMA KS 1; integral shunt trip mechanism; horsepower rated, with clips or bolt pads to accommodate fuses; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- D. Control Circuit: 120-V ac; obtained from integral control power transformer, with primary and secondary fuses.
- E. Accessories:
1. Key switch for key-to-test function.
  2. Red ON pilot light.
  3. Isolated neutral lug.
  4. Mechanically interlocked auxiliary contacts that change state when switch is opened and closed.
  5. Form C alarm contacts that change state when switch is tripped.
  6. Three-pole, double-throw, fire-safety and alarm relay; 24-V dc coil voltage.
- F. Three-pole, double-throw, fire-alarm voltage monitoring relay complying with NFPA 72.

## 2.6 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
  2. Outdoor and Wet Locations: NEMA 250, Type 3R.
  3. Kitchen and Wash-Down Areas: NEMA 250, Type 3R, stainless steel.
- B. Enclosure Finish: The enclosure shall be finished with the standard manufacturer gray finish.
- C. Conduit Entry: NEMA 250 Types 4, 4X, and 12 enclosures shall contain no knockouts.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- C. Securely fasten each switch and circuit breaker to the supporting structure or wall, utilizing a minimum of four (4) 1/4-inch bolts. Do not mount in an inaccessible location or where the passageway to the switch may become obstructed.
- D. Comply with NFPA 70 and NECA 1.
- E. Provide electrical interlock kit and low voltage wiring where utilized on the line side of VFD controller to shut down VFD prior to disconnection of power. Coordinate control wire termination with Division 25.
- F. Provide fusible switches with current limiting fuses or current limiting circuit breaker for equipment disconnecting means where equipment short circuit current rating is insufficient for available fault current.
- G. Where battery lowering devices are specified with Elevators, provide connection between an auxiliary contact at the elevator disconnect and the battery lowering device.
- H. Where enclosed breakers or switched are provided on the load side of a VFD, provide connection between and auxiliary contact at the disconnect and the VFD that will trigger a freewheel stop on the VFD before the disconnect contacts open.

### 3.3 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B. Where a tightening torque is indicated as a numeric value on equipment or in installation instructions provided by the manufacturer, use a calibrated torque tool to achieve that indicated torque value, unless the equipment manufacturer has provided installation instructions for an alternative method of achieving the required torque.

### 3.4 IDENTIFICATION

- A. Comply with requirements in Section 260553, "Identification for Electrical Systems."
  - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
  - 2. Label each enclosure with nameplate.

### 3.5 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Visual and Mechanical Inspection:

- a. Examine equipment nameplate data and confirm proper identification.
  - b. Verify and record fuses sizes and types are in accordance with nameplates and power systems study.
  - c. Inspect the physical, electrical, and mechanical condition of the equipment and all components in accordance with the manufacturers' instructions.
  - d. Inspect anchorage, alignment, and grounding.
  - e. Inspect bolted electrical connections and terminations for high resistance by verifying tightness with calibrated torque-wrench method in accordance with manufacturer's published data.
  - f. Exercise all active components to ensure proper mechanical operation.
  - g. Check all interlocking systems for correct operation.
2. Test ground-fault protection of equipment for service equipment per NFPA 70.
  3. Test all auxiliary devices/system interfaces and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Switches and Circuit Breakers will be considered defective if they do not pass tests and inspections.
- C. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Prepare test and inspection reports, including a certified report that identifies switches and circuit breakers included and that describes results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

### 3.6 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

## **END OF ENCLOSED SWITCHES AND CIRCUIT BREAKERS**

**SECTION 27 05 53 - IDENTIFICATION FOR COMMUNICATIONS SYSTEMS**

**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions, Division 01 Specification Sections and Section 260010 "General Requirements for Electrical" apply to this Section.

1.2 SUMMARY

- A. Section Includes:
  - 1. Color and legend requirements for labels and signs.
  - 2. Labels.
  - 3. Signs.
  - 4. Cable ties.
- B. Related Requirements
  - 1. Refer to Section 260553, "Identification for Electrical Systems" for additional requirements related to labeling of electrical equipment and cabling.

1.3 REFERENCES

- A. Definitions
  - 1. Identifier: An item of information that links a specific element of the telecommunications infrastructure with its corresponding record.
- B. Reference Standards: The following publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest version as of the date of the Contract Documents, unless otherwise specified.
  - 1. Telecommunications Industry Association (TIA):
    - a. ANSI/TIA-606, "Administration Standard for Telecommunications Infrastructure"
  - 2. Underwriters Laboratories Inc (UL)
    - a. UL 969, "Marking and Labeling Systems"

1.4 SUBMITTALS

- A. Product Data: For each product type.
- B. Identification Schedule: Sample system labeling schedules with proposed designations for cables, outlets, terminations, and equipment.

## 1.5 COORDINATION

- A. All identifications shall be consistent with the owner's standard practices, especially within existing facilities, unless otherwise require by codes. Where the requirements herein are in conflict, the contractor shall notify the engineer in writing prior to ordering any material.
- B. All room names and/or numbers for labeling or programming shall use the Owner's approved room name and numbering scheme, not names and numbers indicated on floor plans. All reprogramming shall be included as required to accommodate construction phasing.
- C. Coordinate with Owner for approval of all labelling codes and schemes prior to creation and installation of labeling system.

## **PART 2 - PRODUCTS**

### 2.1 GENERAL REQUIREMENTS

- A. Comply with NFPA 70 and TIA 606 for a Class 2 system.
- B. Comply with UL 969 for Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- C. Labels shall be designed to remain permanently affixed and shall not fade under typical environmental conditions for the life of the product identified.
- D. Thermal Movements: Allow for thermal movements from ambient temperatures up to 120-deg F and surface temperatures up to 180-deg F.
- E. Provide mechanically printed black letters on a white field unless noted otherwise.
- F. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Brady
  - 2. Brother
  - 3. Dymo
  - 4. HellermanTyton
  - 5. Panduit

### 2.2 LABELS AND TAGS

- A. Heat Shrink Tubes: Flame-retardant shrinkable polyolefin tube with thermal transfer-printed identification label. Sized to suit diameter of cable and shrinks to fit firmly around cable it identifies. Full shrink recovery at a maximum of 200 deg F.
- B. Self-Adhesive Labels: Thermal transfer-printed, minimum 3-mil- thick, flexible labels with acrylic pressure-sensitive adhesive.
  - 1. Wraparound Vinyl or Nylon Cloth Type: Repositionable for wrapping and flagging flexible cables.
  - 2. Self-Laminating Vinyl Type: Clear wrap around tail shield laminates the entire printed legend for abrasion, UV-, weather- and chemical-resistance on flexible cables.
  - 3. General Purpose Polyester Type: for component labelling on flat surfaces.



- C. Marker Plate Tags: Thermal transfer printed, UV, weather, and chemical resistant polyolefin suitable for large cables or bundles. Pre-punched holes for attachment with cable ties.

## 2.3 SIGNS AND NAMEPLATES

- A. Engraved Plastic Signs and Nameplates:
  - 1. 3-layer melamine plastic laminate
  - 2. Weather and UV-resistant for Wet and Damp Locations.
  - 3. Thickness:
    - a. For signs up to 20 sq. in., minimum 1/16 inch thick.
    - b. For signs larger than 20 sq. in. or 8 inches in length, 1/8 inch thick.
    - c. Engraved designation with black letters on white face
    - d. Punched or drilled for mechanical fasteners with 1/4-inch grommets in corners for mounting. Exception for locations where specifically approved contact type permanent adhesive may be used where screws cannot or should not penetrate substrate.
    - e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

## 2.4 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system suitable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs:
  - 1. Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.
  - 2. Pop-Rivets.
  - 3. Two-Part Epoxy Adhesive
- C. Cable Ties: Self-extinguishing, one-piece, self-locking, UV-stabilized or plenum rated where required by installed environmental conditions. 3/16-inch minimum width.

## **PART 3 - EXECUTION**

### 3.1 CABLING ADMINISTRATIVE DRAWINGS

- A. Provide professionally produced, scaled drawings using Computer Aided Design software identifying the location and labelling of Communications devices served out of each telecom room.
- B. Print on Arch D or E1 size paper and install in a prominent location in each equipment room and wiring closet so as not to interfere with future equipment installation.
- C. Provide rigid frame and 1/8-inch clear plastic protective overlay.
- D. Supply separate drawings for each Communications Room.

### 3.2 INSTALLATION

- A. Mechanically produce all labels. Write-on labels are not permitted.
- B. Install identifying devices before installing acoustical ceilings or similar concealment.
- C. Verify identity of each item before installing identification products.
- D. Self-Adhesive Identification Products: Before applying communications identification products, clean substrates of substances that could impair bond using materials and methods recommended by manufacturer of identification product and manufacturer of substrate to retain product warranties.
- E. For surfaces that require a finish, apply identification devices to surfaces after completing finish work.
- F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of communications systems and connected items.
- G. Install all labels in a neat manner, plumb and parallel to equipment lines.
- H. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.
- I. Provide labels within 12-inches from cable termination points and secure tight to surface at a location with high visibility and accessibility for ease of identification after termination.

### 3.3 IDENTIFICATION SCHEDULE

- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Equipment Room Racks, Cabinets, and Frames:
  - 1. Identify top and bottom, front and rear of each with self-adhesive engraved laminated plastic nameplate containing rack or cabinet identifier (xy).
  - 2. Label Size: minimum 2-inches in height with letters no less than 1-1/2-inches tall.
- C. Rack Patch Panels and Fiber Enclosures:
  - 1. Label each fiber enclosure and patch panel with a letter (-r) designating the order of the panel from the top of the cabinet or frame.
  - 2. Label each fiber enclosure adapter panel with self-adhesive label indicating range of port numbers.
  - 3. Label fiber enclosure cover with self-adhesive labels indicating each backbone cable link identifier including:
    - a. Near end port numbers
    - b. Far end building identifier (b) for inter building cable
    - c. Far end Telecomm space identifier (fs)
    - d. Far end rack identifier (xy)
    - e. Panel identifier (-r)
    - f. Panel port numbers (:p)

4. Label each patch panel port or group of ports with a self-adhesive label or manufacturer provided insert indicating the following:
    - a. Room number of outlet being served.
    - b. Faceplate number.
    - c. Patch panel port number
  5. Use manufacturer provided labels and mounting surfaces wherever possible.
- D. Wall Punchdown Blocks
1. Label each cable termination position with a sequential number designator.
  2. Where insert type labels are used, install clear plastic cover over mechanically produced labels.
  3. Use manufacturer provided labels and mounting surfaces wherever possible.
- E. Backbone Cables:
1. Label each cable with a thermal transfer marker tag indicating the backbone cable link identifier including the following:
    - a. Strand/pair count and cable type
    - b. Near end identifier and far end identifier including:
      - 1) Building identifier (b) for inter building cable
      - 2) Telecomm space identifier (fs)
      - 3) Rack identifier (xy)
      - 4) Panel identifier (-r)
      - 5) Port grouping(:p)
  2. Label Backbone cables at termination points and entrance/exit point of telecom space.
  3. Outside plant pathways: In addition to labels at termination points, label each backbone cable at all manholes, handholes, and pull points where cable enters and exits pathway.
- F. Horizontal Cables:
1. Label each cable with a vinyl self-laminating label indicating the horizontal cabling link identifier including:
    - a. Room and faceplate number.
    - b. Telecomm Space identifier (fs)
    - c. Rack identifier (xy)
    - d. Patch Panel identifier (-r)
    - e. Patch Panel port number (:p)
  2. Outside plant pathways: In addition to labels at termination points, label each cable at manholes, handholes, and pull points where cable enters and exits pathway.
- G. Faceplates:
1. Label individual faceplates with self-adhesive labels or manufacturer provide insert. Place label at top of faceplate. Each faceplate shall be labeled with its individual, sequential designation, numbered clockwise when entering room from primary egress, indicating the following:
    - a. Room number of outlet
    - b. Faceplate number.

2. Label each individual jack within the same faceplate with its horizontal link identifier.
- H. Telecommunications Bonding Busbars and Conductors
1. Label each Busbar with a self-adhesive label indicating the following:
    - a. Telecomm space identifier (fs)
    - b. Busbar identifier
  2. Label each bonding conductor with a vinyl self-laminating label indicating the far end busbar or object identifier
  3. Label each bonding conductor at its attachment point with a thermal transfer marker tag with the following.
    - a. **WARNING: IF CABLE OR CONNECTOR IS LOOSE OR MUST BE REMOVED PLEASE CONTACT TELECOMMUNICATIONS MANAGER.**
  4. Warning labels: yellow marker plate type with black print.
- I. Underground duct and raceway
1. Label both ends of each underground duct and raceway with self-adhesive label indicating the following:
    - a. Pathway Identifier and sequence number
    - b. Far End Building Identifier (b)
    - c. Far End Telecomm Space Identifier (fs)
    - d. Far End Outdoor Space Identifier (T)

**END OF IDENTIFICATION FOR COMMUNICATIONS SYSTEMS**

## **SECTION 28 46 13 - ADDRESSABLE FIRE ALARM SYSTEMS**

### **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions, Division 01 Specification Sections, and Section 260010 "General Requirements for Electrical Systems" apply to this Section.

#### 1.2 SUMMARY

- A. Description: This section of the specification includes the furnishing, installation, connection and testing of the microprocessor controlled, intelligent reporting fire detection equipment required to form a complete, operative, coordinated system.
- B. Section Includes:
  - 1. Analog-Addressable fire-alarm system.
  - 2. Fire-alarm control unit (FACU/FACP).
  - 3. Manual fire-alarm boxes.
  - 4. System Detectors.
  - 5. Fire-alarm notification appliances.
  - 6. Fire-alarm annunciators.
  - 7. Fire-alarm addressable interface devices.
  - 8. Fire-alarm system communications.
  - 9. Fire-alarm system accessories.
  - 10. Fire-alarm conductors and cabling.

#### 1.3 REFERENCES

- A. Abbreviations and Acronyms
  - 1. DACT: Digital alarm communicator transmitter.
  - 2. FACU (FACP): Fire-alarm control unit (panel).
  - 3. NAC: Notification Appliance Circuit
  - 4. NICET: National Institute for Certification in Engineering Technologies.
  - 5. NRTL: Nationally Recognized Testing Laboratory.
  - 6. SLC: Signaling Line Circuit
- B. Definitions
  - 1. Circuit: Wire path from a group of devices or appliances to a control panel or transponder.
  - 2. Zone: Combination of one or more circuits or devices in a defined building area
- C. Reference Standards: The following publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest date as of the date of the Contract Documents, unless otherwise specified.
  - 1. National Electrical Contractors Association (NECA):

- a. NECA 305, "Standard for Fire Alarm System Job Practices".

#### 1.4 COORDINATION

- A. Testing existing system: Provide a complete functional test of the existing fire alarm systems prior to commencement of work. Report any non-functioning equipment or components to Architect and Engineer. After commencing work, Contractor shall be responsible for ensuring all existing portions of the fire alarm system are properly functioning at all times with no trouble conditions.
- B. Existing Fire-Alarm Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted. When new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service, and label existing fire-alarm equipment "NOT IN SERVICE" until removed from building.
- C. Equipment Removal: After acceptance of new fire-alarm system, remove existing disconnected fire-alarm equipment indicated for removal along with all associated wiring.
- D. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:
  - 1. Notify Engineer and Owner no fewer than 10 days in advance of proposed interruption of fire-alarm service.
  - 2. Identify specific locations affected by interruption, circuits which may be inoperable during the outage, and the length of time the system will be impaired.
  - 3. Do not proceed with interruption of fire-alarm service without the Owner's written permission.
- E. Use of Devices during Construction: Protect devices during construction unless devices are placed in service to protect the facility during construction.

#### 1.5 SUBMITTALS

- A. Approved Permit Submittal: Submittals must be approved by authorities having jurisdiction prior to submitting them to Architect.
- B. Product Data: For each type of product, including furnished options and accessories.
- C. Shop Drawings: Provide for the fire alarm system.
  - 1. Comply with recommendations and requirements in "Documentation" section of "Fundamentals" chapter in NFPA 72.
  - 2. Include floor plans drawn to scale which clearly show locations of devices, equipment. Indicate electrical power connections, approximate location and size of conduit/wiring runs, and other information required to clearly describe the proposed system. Plans should include identification numbers and wiring connections for all equipment and devices in entire fire alarm system.
  - 3. Include enlarged plans, drawn to a scale not less than 1/4 -inch equals 1 foot, for all equipment rooms and any fire command centers with dimensioned equipment layouts.
  - 4. Include detailed riser diagrams based on the project floor plans, with all devices indicated along with proposed circuit routing. The conductor composition for each conduit section

- shall be provided. Show consecutive connections for all devices with addresses, candela ratings, and speaker wattages.
5. Provide scaled elevations, sections, and details, including critical dimensions and details of attachments to other Work.
  6. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
  7. Detail assembly and support requirements.
  8. Annunciator panel details as required by authorities having jurisdiction.
  9. Include current draw for each device submitted and the listed minimum voltage required to operate.
  10. Include voltage drop calculations for notification-appliance circuits. Provide maximum allowable voltage drop for panel and for individual NAC circuits.
    - a. Identify Notification Appliance Circuits (NAC) current draws and voltage drops for each circuit. Utilize the "end of line" method for voltage drop calculations and determine worst case voltage at far end of each circuit. In no case shall the calculated voltage at any notification appliance fall below the minimum listed operating voltage for the devices used.
    - b. Place calculations on a dedicated sheet, for future reference by fire alarm service technicians.
  11. Include battery-size calculations showing battery capacity and supervisory and alarm standby power requirements.
    - a. Use manufacturer's battery discharge curve to determine expected battery voltage after specified time period of providing standby power.
  12. Include system response matrix showing the fire alarm system's actions (outputs) required for each type of alarm, supervisory, and trouble signal. Any non-compliant features must be fully described.
  13. Include written statement from manufacturer that equipment and components have been tested as a system and comply with requirements in this Section and in NFPA 72.
  14. Include performance parameters and installation details for each type of detector.
  15. Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
  16. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale; coordinate location of duct smoke detectors and access to them.
    - a. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators.
    - b. Provide control wiring diagrams and show equipment required for HVAC unit shutdown on alarm and override by firefighters' smoke-evacuation system.
    - c. Locate detectors in accordance with manufacturer's written instructions.
  17. Include equipment rack or console layout, grounding schematic, power calculations, and single-line connection diagram.
  18. Include manufacturer's detailed installation instruction for the Fire Alarm Control Panel and all duct mounted smoke detectors, flow switches, tamper switches, supervisory switches, and similar items which require mechanical installation.
- D. Delegated Design: For notification appliances and detectors, in addition to submittals listed herein, indicate compliance with performance requirements and design criteria, including analysis data signed and sealed by qualified professional responsible for their preparation.
1. Drawings showing location of each notification appliance and smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of device.

2. Design Calculations: Calculate requirements for selecting spacing and sensitivity of detection, complying with NFPA 72. Calculate spacing and intensities for strobe signals and sound-pressure levels for audible appliances.
  3. Indicate audible appliances required to produce square wave signal per NFPA 72.
- E. Qualification Data: For Certified System Designer, Lead Technician, and Installers including names, license numbers, and certifications as described under Quality Assurance.
- F. Sample Warranty.
- G. Field quality-control reports.
- H. Closeout Submittals
1. Operation and Maintenance Data: For fire-alarm systems and components to include in operation and maintenance manuals.
  2. In addition to items specified in Division 01 and Section 260010 "General Requirements for Electrical Systems", include the following:
    - a. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
    - b. Provide "Fire Alarm and Emergency Communications System Record of Completion Documents" according to the "Completion Documents" Article in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
    - c. Provide "Inspection and Testing Form" according to the "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:
      - 1) Equipment tested.
      - 2) Frequency of testing of installed components.
      - 3) Frequency of inspection of installed components.
      - 4) Requirements and recommendations related to results of maintenance.
      - 5) Manufacturer's user training manuals.
    - d. Software and Firmware Operational Documentation: Provide operating manuals and backups of software database on USB media. The database provided shall be useable by any authorized and certified distributor of the product line and shall include all applicable passwords necessary for total and unrestricted use and modification of the database.

## 1.6 MAINTENANCE MATERIAL

- A. Extra Stock Materials: Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Monitor Modules (Addressable Interface): 1% of installed quantity.
  2. Isolation Modules/Isolation Bases: 1% of installed quantity.
- B. Keys and Tools: Two extra sets for access to locked or tamper-proof components.

## 1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications
1. Manufacturer must be regularly engaged in manufacture of fire alarm systems of types, sizes, and electrical characteristics required, and whose products are Listed and Labeled.
  2. Manufacturer shall maintain an authorized distributor within 100 miles of the project location which stocks a full complement of parts for all equipment to be furnished.



- B. Installer Qualifications
  - 1. Obtain certification by NRTL in accordance with NFPA 72.
  - 2. Licensed or certified by authorities having jurisdiction to perform fire alarm installations in the specified jurisdiction.
  - 3. Be in business a minimum of 5 continuous years with documented experience installing fire alarm systems similar in size and scope.
  - 4. Installer must be responsible for all program changes and must be present for all testing and inspections.
  - 5. All connections to the FACP and the system's programming shall only be done by the manufacturer, or by an authorized distributor.
  
- C. Project Personnel Requirements: Installer must have the following certified full-time employees on staff and assigned to the project.
  - 1. All personnel must be trained and certified by manufacturer for installation of units required for this Project.
  - 2. System Designer: Preparation of shop drawings, cabling administration drawings, and field-testing program development by a NICET certified Level IV technician who shall be trained and certified in fire alarm system design by the approved manufacturer within the last 36 months and be licensed by the authorities having jurisdiction.
  - 3. Lead Technician: Minimum NICET certified Level III technician who shall provide all devices, connections, and programming for the fire alarm system. Technician shall be certified by the approved manufacturer within the last 36 months and licensed by the authorities having jurisdiction. The lead technician shall be present at all times when work of this Section is performed at the project site.
  - 4. Installer Qualifications: Any work related to this section shall be installed by personnel trained and certified by the approved manufacturer within the last 24 months.

## 1.8 WARRANTIES

- A. Manufacturer Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship for a period of 2 years from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### 2.1 GENERAL REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency acceptable to the authority having jurisdiction, and marked for intended location and application.
- B. All components provided shall be listed for use with the selected system.

### 2.2 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by one of the following:
  - 1. Edwards EST
  - 2. Notifier
  - 3. Siemens

4. Simplex JCI

- B. Being listed as an acceptable Manufacturer in no way relieves obligation of the Contractor to provide all equipment and features in accordance with these specifications.
- C. Existing Equipment: Components must be compatible with and operate as extension of the existing fire alarm system. Equipment must not impair reliability or operational functions of the existing system. Provide system manufacturer's certification that components provided have been tested as, and will operate as, a system.

2.3 ADDRESSABLE FIRE ALARM SYSTEM REQUIREMENTS

- A. Noncoded, UL-certified, FM Global-approved, Networked analog/addressable system, with multiplexed signal transmission and horn/strobe evacuation.
- B. The system shall be designed, inspected, tested, and approved to provide occupant notification audibility levels of 15 dBA over ambient conditions. Design intelligibility to ensure Common Intelligibility Standard (CIS) rating of 0.7 or Sound Transmission Index of 0.5 in all areas designated on the drawings to have intelligible audio.
- C. Fire Alarm System shall supervise and monitor the integrity of all sub-systems, circuits, and devices connected to the system and annunciate all system faults. All intelligent initiating, signaling, and control devices shall be individually addressed.
- D. The system shall be fully programmable so that any type of input event can be correlated to any combination of output functions.
- E. The fire alarm system operational priority shall ensure that life safety functions takes precedence over other activities coordinated by the system.

2.4 SYSTEMS OPERATIONAL DESCRIPTION

- A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:
  - 1. Manual stations.
  - 2. Heat detectors.
  - 3. Smoke detectors.
- B. Fire-alarm signal must initiate the following actions:
  - 1. Continuously operate alarm notification appliances.
  - 2. Identify alarm and specific initiating device at fire-alarm control unit and any remote annunciators or network connected control panels. The system alarm LED shall flash and a local distinct audible signal in the control panel shall sound.
  - 3. Transmit an alarm signal to the remote alarm receiving station.
  - 4. Unlock electric door locks in designated egress paths.
  - 5. Release magnetic door holders of designated fire and smoke doors.
  - 6. Close smoke dampers in air ducts of designated air-conditioning duct systems.
  - 7. Record events in system memory.
  - 8. Record events by system printer.
- C. Carbon monoxide alarm signal initiation shall be by one or more of the following devices and systems:

1. Carbon monoxide detector
- D. Carbon monoxide alarm signal must initiate the following actions:
1. Continuously operate alarm notification appliances using a distinctive four-pulse pattern complying with NFPA 720.
  2. Identify alarm and specific initiating device at fire-alarm control unit and any remote annunciators or network connected control panels. The system alarm LED shall flash and a local distinct audible signal in the control panel shall sound.
  3. Transmit a carbon monoxide alarm signal to the remote alarm receiving station.
- E. Supervisory signal initiation shall be by one or more of the following devices and actions:
1. Control valve tamper supervisory switch.
  2. Duct smoke detectors.
  3. Device tamper.
  4. Zones or individual devices have been disabled.
  5. Elevator shunt-trip control circuit supervision for Shut-Down.
  6. Elevator hoistway detectors for Recall.
- F. System Supervisory Signal Actions:
1. Identify specific device initiating the event at fire-alarm control unit and remote annunciators. The corresponding system LED shall flash and a local distinct audible signal in the control panel shall sound.
  2. Record the event on system printer.
  3. Transmit a supervisory signal to the remote alarm receiving station with no time delay.
- G. System trouble signal initiation shall be by one or more of the following devices and actions:
1. Open circuits, shorts, and grounds in circuits.
  2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
  3. Loss of communication with any addressable device or networked panel.
  4. Loss of primary power at fire-alarm control unit.
  5. Ground or a single break in internal circuits of fire-alarm control unit.
  6. Abnormal AC voltage at fire-alarm control units.
  7. Break in standby battery circuitry.
  8. Failure of battery charging.
  9. Abnormal position of any switch at fire-alarm control unit or annunciator.
  10. Voice signal amplifier failure.
  11. Smoke Detector Contamination.
  12. Carbon Monoxide Detector End of Life.
  13. Hose Cabinet Door Open.
- H. System Trouble Signal Actions:
1. Identify specific device initiating the event at fire-alarm control unit and remote annunciators. The system trouble LED shall flash and a local distinct audible signal in the control panel shall sound.
  2. Record the event on system printer.
  3. Transmit a trouble to the remote alarm receiving station after a programmable time delay of 200 seconds or as required by AHJ.
  4. A trouble signal from loss of primary power shall not be transmitted unless maintained after a programmable time delay of 1 to 3 hours or as required by AHJ.

5. Fire alarm signal shall override trouble signals, but any pre-alarm trouble signal shall reappear when the panel is reset.

## 2.5 FIRE ALARM CONTROL UNIT (FACU/FACP)

### A. General Requirements for Fire Alarm Control Panel:

1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with NFPA 72 and UL 864, and protected from voltage surges and line transients.
  - a. System software and all control-by-event programs shall be held in nonvolatile memory, electrically erasable, programmable, read-only memory, retaining the information through failure of primary and secondary power supplies.
  - b. Include a real-time clock for time annotation of events on the event recorder and printer. Time-of-Day and date shall be retained through failure of primary and secondary power supplies.
  - c. The Central Processing Unit (CPU) shall communicate with, monitor, and control all other modules within the control panel. Removal, disconnection, or failure of any control panel module shall be detected and reported to the system display by the CPU.
  - d. Provide communication between the FACP and intelligent detectors, addressable modules, local and remote operator terminals, remote circuit interface panels, annunciators, and other system-controlled devices.
  - e. The FACP shall be listed for connection to a central-station signaling system service.
  - f. The system is to have multiple access levels, so owner's authorized personnel can disable individual alarm inputs or normal system responses (outputs) for alarms, without changing the system's executive programming or affecting operation of the rest of the system. A minimum of two different password levels shall be accessible through the display interface assembly to prevent unauthorized system control or programming.
2. Addressable Control Circuits for Operation of Notification Appliances and Mechanical Equipment: The FACP shall be listed for releasing service.
3. The system shall perform time-based control functions including automatic changes of specified smoke detector sensitivity settings.
4. Digitized electronic signals shall employ check digits or multiple polling. In general, a single ground or open on any system signaling line circuit shall not cause system malfunction, loss of operating power, or the ability to report an alarm.
5. Loss of Power: Alarm signals arriving at the main FACP shall not be lost following a power failure (or outage) until the alarm signal is processed and recorded.

### B. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, three lines of 80 characters, minimum.
2. Alphanumeric Touch Keypad: Arranged to permit entry and execution of programming, display, and control commands.
3. Color coded system status LEDs. At minimum, Indicate the status of the following system parameters:
  - a. System AC Power

- b. System Common Alarm
  - c. System Common Trouble
  - d. System Supervisory
  - e. Signal Silence
4. Provide operator's interface which allows the following minimum functions. In addition, the operator's interface shall support any other functions required for system control and/or operation:
- a. Signal Silence Switch: Silenced audible signal shall resound in a time period acceptable to AHJ if the condition has not been resolved.
  - b. System Reset Switch
  - c. System Test Switch
  - d. Panel Silence Switch
  - e. Panel Lamp Test Switch
  - f. System Bypass Switches: Programmable, supervised switches for fire safety function bypasses. i.e. NAC Bypass, Elevator Capture Bypass, HVAC Shutdown Defeat, Smoke Control Bypass, etc. Switch operation shall be password protected.
  - g. Interface shall allow programming of the system without any external programming equipment. Systems that require the use of external programmers or change of EPROMs are not acceptable.
- C. Notification-Appliance and Signaling-Line Circuits:
- 1. Signaling Line Circuits (SLC): NFPA, Class B.
    - a. Provide a minimum of one signaling line circuit per floor.
    - b. Locate end of line resistors
  - 2. Notification Appliance Circuits (NAC): NFPA 72, Class B.
  - 3. SLC Between Networked Panels: NFPA 72, Class X.
  - 4. Door Hold Open control circuits: NFPA 72, Class D for fail safe operation.
  - 5. Size each signaling line circuit and notification appliance circuit to allow a minimum additional capacity of 20%.
- D. Signaling Line Circuit (SLC) Modules:
- 1. Power limited, capable of accommodating up to 198 addressable devices on each SLC and a minimum of 1980 initiating points per system.
  - 2. On-board microprocessor capable of operating in a local mode in the event of a failure in the main CPU of the control panel.
  - 3. Capable of receiving analog information from all intelligent detectors and processing the information to determine whether normal, alarm, or trouble conditions exist for specific detectors.
  - 4. Automatically maintain detector desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. Analog information may also be used for automatic detector testing and for the automatic determination of detector maintenance requirements.
- E. Notification-Appliance Circuit (NAC) Modules:
- 1. Power limited, minimum circuit output rating: 2 Amps at 24VDC.
  - 2. Polarized to provide for both synchronized strobes and independent horn/strobe operation over two wires.
  - 3. Selectable as auxiliary power outputs and rated for continuous duty.

- F. Network Communication
  - 1. Provide a dedicated fiber optic TCP/IP network utilizing listed network components to interconnect multiple FACPs.
  - 2. Synchronize panel time, signal patterns, and indicator flash rates across all panels on the network.
  - 3. In the event of network wiring faults, each panel on the network shall re-configure into a sub-network and continue to respond to alarm events.
  
- G. Serial Interfaces:
  - 1. One USB port for system printer.
  - 2. One USB or Ethernet port for on-site programming or system modification with a PC.
  
- H. Smoke-Alarm Verification:
  - 1. Initiate audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.
  - 2. Activate an approved "alarm-verification" sequence at fire-alarm control unit and detector.
  - 3. Record events by the system printer.
  - 4. Sound general alarm if the alarm is verified.
  - 5. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.
  
- I. Elevator Recall and Shutdown:
  - 1. Elevator recall shall be initiated only by one of the following alarm-initiating devices:
    - a. Elevator lobby detectors except the lobby detector on the designated floor.
    - b. Smoke detector in elevator machine room/space or control room/space.
    - c. Smoke detectors in elevator hoist way.
  - 2. Program elevator controller to move the cars to the alternate recall floor if lobby detectors located on the designated recall floors are activated.
  - 3. Heat Detectors or Water-flow alarm associated with sprinklers in an elevator shaft and elevator machine room shall remove power to elevators associated with the location without time delay.
    - a. Water-flow switch associated with the sprinkler in the elevator pit may have a delay to allow elevators to move to the designated floor.
  
- J. Door Controls: Door hold-open devices that are controlled by smoke detectors at doors in smoke-barrier walls shall be connected to and powered by fire-alarm system.
  
- K. Remote Smoke-Detector Sensitivity Adjustment and Testing: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out final adjusted values on system printer. The system shall also annunciate a trouble condition when any smoke detector approaches 80% of its alarm threshold due to gradual contamination, with an annunciation of the location of the smoke detector requiring service. If any specialized equipment must be used to program any function of the smoke detector devices, then one must be furnished as part of the system.

- L. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station in accordance with parameters specified herein.
  
- M. Primary Power: Obtained from dedicated 120-V ac branch circuit and a high efficiency power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory and digital alarm communicator transmitters shall be powered by 24-V dc source.
  - 1. Power supply modules shall have a continuous rating adequate to power all equipment and functions in full alarm continuously. All modules and drivers must be able to withstand prolonged short circuits in the field wiring, either line-to-line or line-to-ground, without damage. The power supply shall be expandable for additional notification appliance power in 3.0 Ampere increments.
  - 2. Each system power supply shall be individually supervised.
  - 3. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating to allow for future system expansion.
  - 4. Install lock clips on circuit breakers in the "ON" position.
  
- N. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch for system operation in the event of primary power source failure. Transfer from normal to auxiliary (secondary) power or restoration from auxiliary to normal power shall be automatic and shall not cause transmission of a false alarm.
  - 1. Batteries: Maintenance-free, rechargeable, sealed, lead acid with rated lifespan of 10 years.
  - 2. Provide sufficient capacity to operate the complete alarm system in normal, supervisory, or trouble conditions, including audible trouble signal devices, mode for a period of 24 hours. Following this period of operation on battery power, the battery shall have sufficient capacity to operate all components of the system, including all alarm notification devices in alarm mode for a period of 15 minutes. Battery capacity must include a 25% safety factor.
  - 3. Locate batteries either within the control panel or in a separate substantial steel cabinet, finished on inside and outside with enamel paint. Provide a cylinder lock keyed to match FACP. Separate cells to prevent contact between terminals of adjacent cells and between terminals and other metal parts.
  - 4. Battery Charger: Provide solid state automatic float type, capable of dual rate charging techniques that will recharge a fully discharged battery to a minimum 70% capacity in 12 hours or less. Locate charger within the control panel or within the battery cabinet. Provide voltmeter and ammeter to indicate battery voltage and charging current.
  - 5. All standby batteries shall be continuously monitored by the power supply. The power supply shall be able to perform an automatic test of batteries and indicate a trouble condition if the batteries fall outside a predetermined range.
  
- O. Enclosure: Provide the FACP with a listed cabinet suitable for surface or semi-flush mounting. Cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators. For convenience, the door may be hinged on either the right or left side (field selectable).
  
- P. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

## 2.6 REMOTE POWER SUPPLIES

- A. Stand-alone panel capable of powering a minimum of four synchronized NACs. Power limited, 24 VDC, filtered-regulated, and supervised. Configurable as a continuous 24VDC auxiliary power output.
- B. Alarms from the host fire alarm control panel shall signal the NAC remote power supply panel to activate. The panel shall monitor itself and each of its NACs for trouble conditions and shall report trouble conditions to the host panel.
- C. Internal Primary and Secondary power supplies: comply with performance requirements for FACP.

## 2.7 MANUAL FIRE ALARM BOXES

- A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes must be finished in red with molded, raised-letter operating instructions in contrasting color; must show visible indication of operation; and must be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
  - 1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type with visual indicator of operation; with screw terminals and integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control panel. When the station is operated, the handle shall lock in a manner showing visual indication of operation.
  - 2. Station Test/Reset: Key-operated test/reset switch. Stations shall be keyed alike with the fire alarm control panel.
  - 3. Manual pull stations that initiate an alarm condition when opening the unit are not acceptable.
  - 4. Indoor Protective Shield: Where indicated, provide factory-fabricated, clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.
  - 5. Weatherproof Protective Shield: At wet locations, provide factory-fabricated, clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm.
  - 6. Material: High impact Lexan Polycarbonate or Cast Metal.
  - 7. Suitable for ambient temperatures up to 120 deg F.
  - 8. Where required, provide weatherproof backbox and device listed for outdoor applications.

## 2.8 SYSTEM DETECTORS

- A. General Requirements:
  - 1. Operating Voltage: 24VDC, nominal. Two-wire type.
  - 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to FACP through a SLC.
  - 3. Device Identification: Detectors shall permanently store an internal identifying type code that the control panel shall use to identify the type of device.
  - 4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base.
  - 5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.



6. Integral Visual-Indicating Light: dual LED type. LEDs shall flash under normal conditions, indicating that the device is operational and in regular communication with the control panel. The flashing mode operation of the detector LEDs shall be optional through the system field program.
  7. Automatic Device Mapping: Detector address must be accessible from FACP and must be able to identify detector's location within system and its sensitivity setting.
  8. Detectors shall be rated for operation in the following environment unless noted otherwise:
    - a. Temperature: 32 deg F to 120 deg F
    - b. Humidity: 0-93% relative humidity, non-condensing
  9. Remote Control: Unless otherwise indicated, detectors shall be digital-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.
    - a. Multiple levels of detection sensitivity for each sensor.
    - b. Sensitivity levels based on time of day.
    - c. Automatically compensate for detector sensitivity changes due to ambient conditions and dust build-up within detectors.
  10. Test Means: Provide a test means whereby detectors will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself or initiated remotely on command from the control panel when in the "test" condition.
  11. Factory finished in color white.
- B. Photoelectric Smoke Detector: Comply with UL 268.
1. Intelligent photoelectric smoke detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.
  2. Each detector shall utilize an environmental compensation algorithm that shall automatically adjust for background environmental conditions such as dust, temperature, and pressure.
    - a. Provide a maintenance alert signal when 80% of the available compensation range has been used.
    - b. Provide a dirty fault signal when 100% or greater compensation has been used.
  3. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
    - a. Primary status.
    - b. Device type.
    - c. Present average value.
    - d. Present sensitivity selected.
    - e. Sensor compensation range (normal, dirty, etc.).
- C. Duct Smoke Detector: Comply with UL 268A.
1. Listed for air velocity, temperature, and humidity present in specific duct application with standard Intelligent Photoelectric Detector and detector mounting base.
  2. Duct Housing Enclosure: NRTL listed for use with supplied detector for smoke detection in HVAC system ducts. Provide gasketed NEMA 4X housing for harsh environments.
  3. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
  4. Relay Fan Shutdown: Fully programmable supervised relay rated to interrupt fan motor-control circuit.

- D. Heat Detector: Comply with UL 521.
  - 1. Heat detectors shall use an electronic sensor to measure thermal conditions caused by a fire and shall, on command from the control panel, send data to the panel representing the analog level of such thermal measurements.
  - 2. Fixed Temperature Type: Actuated by fixed temperature of 135 deg F unless otherwise required.
  - 3. Combination Type: Actuated by fixed temperature of 135 deg F or rate of rise that exceeds 15 deg F per minute unless otherwise required.
  - 4. Rated for ceiling installation at a minimum of 50 ft centers and suitable for wall mount applications.
  
- E. Multicriteria Detector
  - 1. Multi-criteria optical smoke sensor with integrated rate of rise sensing and optional carbon monoxide detection.
  - 2. Integrated nuisance rejection to reduce unwanted alarms.
  - 3. Provide independent signals to the control panel for detectors with CO sensors.
  
- F. Electro-chemical Carbon Monoxide (CO) Detector: Comply with UL 2075.
  - 1. Initiates a Temporal 4 tone when paired with a sounder base for local audible notification.
  - 2. Transmit a maintenance condition to the control panel when the sensor approaches the end of its useful life.
  - 3. Capable of a functional gas test using a canned test agent to test the functionality of the CO sensing cell.
  
- G. Detector Bases: Suitable for mounting to standard 4-inch octagon or square outlet boxes.
  - 1. Standard Base: Twist lock, suitable for all intelligent detectors. Provided with integral terminal strips for circuit connections, rather than wire pigtails. Capable of supporting a remote alarm indicator light.
  - 2. Relay base: Includes programmable, supervised relay, configurable for control with attached detector or from the FACP. Minimum contact rating of 1 amp at 30VDC and listed for pilot duty.
  - 3. Sounder Base: Includes piezoelectric sounder with configurable low or high output, programmable operation, listed to UL 268. Produces Temporal Code 4 tone for CO detectors and Temporal Code 3 tone for all other detectors. or low frequency 520Hz signal tone patterns.
  - 4. Low Frequency Sounder Base: Emits 520Hz tone as defined by NFPA 72 for sleeping areas, listed to UL 268 and UL 464.
  - 5. Isolator Base: Includes integral isolation module.

## 2.9 NOTIFICATION APPLIANCES

- A. General Requirements
  - 1. Connected to system notification-appliance signal circuits, zoned as noted, equipped for mounting as indicated, and with in and out screw terminals for system connections.
  - 2. All visual appliances shall be synchronized. Light and audible output levels shall be designed to meet ADA and NFPA requirements.
  - 3. Audible/Visual Combination Devices shall comply with all applicable requirements for both Audible Notification and Visible Notification Appliances.

4. Devices located in a damp or wet location shall be listed for environment. Exterior mounted devices shall be provided with a weatherproof backbox.
5. Devices located in sleeping areas shall produce a low frequency alarm signal that has a fundamental frequency of 520Hz +/- 10% and shall be a square wave.
6. Factory finished in color white.

B. Fire Alarm Audible Notification Appliances:

1. Description: Electric vibrating polarized Horns or other notification devices that cannot output voice messages.
2. Performance Criteria: Comply with UL 464.
3. Audible appliances shall sound in a three-pulse temporal pattern, as defined in NFPA 72.
4. Locate audible devices to provide audibility requirements of "Notification Appliances" chapter in NFPA 72.
5. Voltage: 24VDC nominal
6. Mounting: Flush mount on a standard electrical box.
7. Minimum rated sound pressure level of 85dBA at 10 feet for a three pulse temporal pattern.

C. Fire Alarm Visible Notification Appliances: LED strobe lights with clear high impact polycarbonate lens mounted on an aluminum faceplate, complying with UL 1971. The word "FIRE" is engraved in minimum 1-inch- high letters on the housing.

1. Rated Light Output: 15/30/75/110cd or 135/177/185cd, switch selectable at the device. Selected strobe rating shall be visible when the horn-strobe is in its installed position.
2. Voltage: 24VDC nominal
3. Mounting: Wall or ceiling mounted to standard electrical box unless otherwise indicated.
4. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
5. Flashing shall be in a temporal pattern, synchronized with other units. Maximum pulse duration: 2/10ths of one second.
6. Strobe Leads: Factory connected to screw terminals.

D. Bell: Vibrating under dome type with 10-inch gong, utilize a heavy-duty mechanism, polarized for supervised operation.

1. Voltage: 24VDC nominal.
2. Mounting: Semi-Flush mount on a standard electrical box.

## 2.10 ANNUNCIATORS

A. Fire Alarm Remote Annunciator

1. Description: Annunciator functions must match those of FACP for alarm, supervisory, and trouble indications. Manual switching functions must match those of FACP, including acknowledging, silencing, resetting, and testing.
2. Mounting: Flush cabinet, NEMA 250, Type 1.
3. Annunciator shall communicate with the fire alarm control panel via a supervised RS-485 communications loop that supports multiple annunciators and shall individually annunciate all zones in the system.
4. Display Type and Functional Performance: Large format LCD Alphanumeric display and LED indicating lights must match those of FACP. Provide manual control switches to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

5. Power shall be supplied directly from the FACP or listed auxiliary power supply, ensuring a reliable and monitored power source.
- B. Fire Alarm Graphic Annunciator Panel: Mounted in aluminum frame with nonglare, minimum 3/16-inch thick, clear acrylic cover over graphic representation of facility. Detector locations must be represented by red LED lamps. Normal system operation must be indicated by lighted, green LED. Trouble and supervisory alarms must be represented by amber LED.
1. Comply with UL 864.
  2. Operating voltage must be 24 VDC provided by local battery backed up 24 V power supply provided with annunciator.
  3. Include built-in voltage regulation, reverse polarity protection, RS 232/422 serial communications, and lamp test switch.
  4. Semi flush mounted in NEMA 250, Type 1 cabinet, with key lock and no exposed screws or hinges.
  5. Graphic representation of facility must be CAD drawing and each initiating device must be represented by LED in its actual location. CAD drawing must be at 1:100 scale or larger.
  6. LED representing detector must flash two times per second while detector is in alarm.

## 2.11 ADDRESSABLE INTERFACE DEVICES

- A. General Requirements:
1. Arrange to monitor or control one or more system components that are not otherwise equipped for addressable communication. Modules shall be used for monitoring of waterflow, valve tamper, non-addressable devices, and control of building systems.
  2. All Circuit Interface Devices shall be supervised and uniquely identified by the control unit. Module identification shall be transmitted to the control unit for processing according to the program instructions.
  3. Equip each module with two (2) diagnostic indicators; a green LED to confirm communications and a red LED to display active status. LEDs shall be visible through the finished cover plate. The module shall be capable of storing a unique serial number and up to 24 diagnostic codes, hours of operation, number of alarms and troubles, and time of last alarm in its memory which can be retrieved for troubleshooting.
  4. Include electronic address-setting means on the module.
- B. Monitor Module: Microelectronic module providing system address for alarm-initiating devices in wired applications with normally open contacts.
1. Supervision: Unless specifically noted otherwise on the drawings provide one monitor module for each sprinkler flow, tamper, and pressure switch.
- C. Control Relay Module: For control of auxiliary devices or equipment.
1. Provide form C dry relay contacts rated 24VDC at 2 amps.
- D. Isolation Module: For short circuit protection on signaling line circuits.
1. When a short circuit is detected, the module isolates the affected segment on the circuit, allowing the remaining devices to continue functioning.
  2. Self-restoring and automatically reconnects to the circuit segment when the fault is removed.
  3. SLC isolation shall be provided for each floor or protection zone of building.

## 2.12 DIGITAL ALARM COMMUNICATIONS

- A. UL 864 listed as conforming to the requirements of NFPA 72 for Central Station connections.
- B. IP/Cellular digital alarm communications transmitter (IP DACT): capable of sending system events to compatible remote central station receivers over a cellular or IP path.
  - 1. UL 864 listed as conforming to the requirements of NFPA 72 for Central Station connections.
  - 2. TCP/IP Ethernet Communicator supporting encrypted communications.
  - 3. Cellular Communicator: LTE fall back cellular connection through the cellular module. Provide antenna extension kits where required to ensure a high-quality connection.
- C. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture a transmission line and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If primary service is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of primary line to the remote alarm receiving station over the remaining transmission line. Transmitter shall automatically report transmission channel restoration to the central station. If service is lost on both transmission channels, transmitter shall initiate the local trouble signal.
- D. Digital Data Transmission must include the following at a minimum:
  - 1. Address of alarm-initiating device.
  - 2. Address of supervisory signal.
  - 3. Address of trouble-initiating device.
  - 4. Loss of ac supply, where exceeding programmable time delay.
  - 5. Loss of power.
  - 6. Low battery.
  - 7. Abnormal test signal.
  - 8. Communication bus failure.
- E. Local functions and display at the digital alarm communicator transmitter shall include the following:
  - 1. Supervised communications.
  - 2. Programmable
  - 3. Auxiliary relay to indicate alarm or trouble.
  - 4. LED display with audible trouble alarm.
  - 5. Manual test report function and manual transmission clear indication.
  - 6. Communications failure with the central station or fire-alarm control unit.
- F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

## 2.13 SYSTEM ACCESSORIES

- A. Magnetic Door Holders: wall or floor mounting and complete with matching doorplate. The door portion shall have a plated steel pivot mounted armature with shock absorbing nylon bearing. Material and finish to match door hardware.
  - 1. Operation: Under normal conditions, the magnets shall attract and hold the door open. Upon activation of the building fire alarm system, the devices shall be de-energized, thus releasing the doors on the circuit.
  - 2. Electromagnets: Require no more than 1 W to develop 35-lbf holding force.

3. Wall-Mounted Units: Flush mounted in a single gang electrical box unless otherwise indicated.
4. Rating: 24-V dc operating on power from the fire alarm control panel.
5. Power source shall be supervised.
6. Door hold open magnets shall be furnished with keepers, door chains, and other accessories as required to properly hold open doors as indicated on the Drawings.
7. Operation: Under normal conditions, the magnets shall attract and hold the door open. Upon activation of the building fire alarm system, the devices shall be de-energized, thus releasing the doors on the circuit.

B. Surge Suppression Devices:

1. AC circuits: UL 1449 listed, 120VAC, 20A branch circuit surge suppressor with EMI filtering. Ditek DTK-DF120S1 or equal. Shunt type devices are not permitted.
2. DC circuits: UL 497B listed, 24VDC, 5A multi stage hybrid design surge suppressor. Ditek DTK-2MHL P or equal. Devices using only MOV active elements are not permitted.

C. Wire Guards: Welded steel wire mesh of size and shape for manual stations, detectors, strobes, or other devices requiring protection.

1. Guard design shall not affect performance of device.
2. Factory fabricated and furnished by manufacturer of device.
3. Finish: Paint of color to match the protected device.

D. Remote Alarm Indicator Lights: Key type switch for testing of the annunciated device.

E. Terminal Cabinets: Steel cabinet with red finish, hinged lift-a-way cover, barrel key lock, terminal identification labels, and listed terminal blocks for up to 120 high barrier termination points. Terminal block screws shall have pressure wire connectors of the self-lifting or box lug type. Provide "FIRE ALARM TERMINAL CABINET" label in permanent lettering on the enclosure cover

F. Documentation Cabinet: Steel cabinet with red finish, hinged cover, barrel key lock, key ring hooks for spare keys, and USB storage device for backup documentation. Sized to accommodate standard 8 1/2 by 11 Operation and Maintenance manuals, As-Built Drawings, Completion Documents, and Inspection and Testing Form required by NFPA 72. Provide "SYSTEM RECORD DOCUMENTS" label in permanent lettering on the enclosure cover.

## 2.14 FIRE ALARM CONDUCTORS AND CABLE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Allied Wiring and Cable
2. Belden
3. Comtran Corporation
4. General Cable
5. Honeywell Genesis
6. Radix Wire & Cable
7. Southwire
8. Superior Essex
9. West Penn Wire

- B. General Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.
  - 1. Type FPLR or FPLP, red jacket, suitable for indoor locations.
  - 2. Type PLTC, suitable for underground or wet locations.
  - 3. Twisted, shielded pair, low capacitance, not less than No. 18 AWG unless recommended otherwise by system manufacturer.
  - 4. Circuit Integrity Cable: Classification CI, for power-limited fire-alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a two-hour rating.

### **PART 3 - EXECUTION**

#### 3.1 EXAMINATION

- A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.
  - 1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.
- B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 EQUIPMENT INSTALLATION

- A. All equipment supplied must be specifically listed for its intended use and shall be installed in accordance with the manufacturer's recommendations. The contractor shall consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.
- B. Comply with NECA 305, NFPA 70, NFPA 72, and requirements of AHJ for installation and testing of fire-alarm equipment. Install electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."
  - 1. Devices placed in service before all other trades have completed cleanup shall be replaced.
  - 2. Devices installed but not yet placed in service shall be protected from construction dust, debris, dirt, moisture, and damage according to manufacturer's written storage instructions.
- C. Securely fasten all system components to wall and ceiling assemblies using fasteners and supports rated to support the required load in accordance with Section 260500, "Common Work Results for Electrical Systems".
  - 1. Ceiling mounted devices shall not be supported solely by suspended ceilings.
- D. Install wall-mounted equipment, with tops of cabinets not more than 78 inches above finished floor. Locate annunciators at a height that enables easy viewing.

- E. Provide additional remote NAC power supplies as required to comply with voltage drop requirements.
- F. Manual Fire-Alarm Boxes:
  - 1. Install manual fire-alarm boxes in the normal path of egress within 60 inches of the exit doorway.
  - 2. Mount manual fire-alarm box on a background of a contrasting color.
  - 3. The operable part of manual fire-alarm box shall be between 42 inches and 48 inches above floor level. All devices shall be mounted at the same height unless otherwise indicated.
- G. Notification Devices:
  - 1. Comply with NFPA 72 and ADA criteria for strobe visual intensity, audible appliance intelligibility, and final device placement.
  - 2. Install wall devices with entire lens between 80-inches and 96-inches above the floor but not less than 6 inches below the ceiling. Install devices on flush-mounted back boxes with the audible device-operating mechanism concealed behind a grille. Install all devices at the same height unless otherwise indicated.
- H. End of Line (EOL) Resistors: Label devices containing end-of-line resistors with NAC panel and circuit number in such a manner that removal of the device is not required to identify the EOL device. Locate EOL devices in a readily accessible location no more than 12-feet above finished floor.
- I. Smoke and Heat Detectors:
  - 1. Comply with the "Smoke-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for smoke-detector spacing.
  - 2. Comply with the "Heat-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for heat-detector spacing.
  - 3. Smooth ceiling spacing for smoke detectors shall not exceed 30 feet except in corridors where increased spacing are allowed in accordance with NFPA 72.
  - 4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Annex A or Annex B in NFPA 72.
  - 5. HVAC: Locate detectors not closer than 36 inches from diffusers or return-air openings.
  - 6. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture and not directly above pendant mounted or indirect lighting.
  - 7. When installed in a room, detectors shall be oriented, so their alarm light is visible from the nearest door to the corridor.
  - 8. Unless suitably protected against dust, paint, etc., spot type smoke detectors shall not be installed until the final construction clean-up has been completed. In the event of contamination during construction, the detectors must be replaced by the contractor at no additional cost to the Owner. Covers supplied with smoke detector heads do not provide protection against heavy construction dust, spray painting, etc., and must not be used for that purpose. They are suitable only during final, minor cleanup or touchup operations.
- J. Duct Smoke Detectors:
  - 1. Provide duct smoke detectors for the following locations:
    - a. At all smoke dampers.
    - b. At all HVAC units (AHUs, OA units, Heat Pump Units, etc) with fans greater than 2,000 CFM.



- c. At each story, prior to the duct connection at a common return, for air distribution systems with a combined capacity greater than 15,000 CFM serving more than one story.
    - d. Additional locations required by the Building Code.
  2. Comply with NFPA 72, IMC, and NFPA 90A for HVAC unit shutdown and closing of smoke dampers.
  3. Install sampling tubes so they extend the full width of duct.
  4. Support tubes more than 36 inches long at both ends.
  5. Extend the intake tube through the far side of the duct, seal around the tube where it penetrates the duct wall and plug the end with a rubber stopper to facilitate visual inspection and intake tube cleaning.
  6. Do not install smoke detector in duct smoke-detector housing during construction. Install detector only during system testing and prior to final acceptance.
  7. Locate duct detectors in a manner that provides suitable, convenient access for required periodic cleaning and calibration.
  8. Comply with manufacturer's requirements for clearances from HVAC equipment and duct accessories such as humidifiers.
  9. Provide number of detectors per duct in accordance with NFPA 72 requirements based on the size of the air duct, air duct configuration, air speed, and duct manufacturer's installation requirements.
  10. Indicate airflow direction on the duct, adjacent to the detector, using stencil or permanent decal.
  11. Provide each duct smoke detector with a remote keyed test switch and alarm indicator.
- K. HVAC Unit Shutdown
  1. Provide control relays for HVAC unit shutdown at the following minimum locations:
    - a. For all fans associated with HVAC units (including fan powered VAVs) connected to an air distribution system with a combined capacity greater than 2,000 CFM. Shut down fans upon activation of the associated smoke detector(s).
    - b. For all High Velocity Low Speed (HVLS) ceiling fans. Shut down fans upon activation of sprinkler system water flow alarm.
  2. Comply with NFPA 72, IMC, and NFPA 90A for supervision and control of HVAC unit shutdown components.
  3. All shutdown relays shall be directly controlled and monitored by the fire alarm system. Wire relays for fail safe operation.
  4. The Building Automation System (BAS) shall not be used for life safety functions unless the BAS is supervised by the Fire Alarm System for off normal conditions.
- L. Remote Status and Alarm Indicators: Install in visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position and where specifically indicated. Locate in the nearest corridor or public area and identify with engraved label.
- M. Carbon Monoxide Detectors:
  1. Ceiling mounted CO detectors should be kept 12-inches from sidewalls.
  2. Wall mounted CO detectors should be at least 48-inches above the finished floor, but less than 6-inches from the ceiling.
  3. Locate at least 60-inches from fuel burning appliances.
  4. Install CO detectors no closer than 36 inches from air supply diffusers or return-air openings.

- N. Elevator Hoistway and Machine/Control Rooms and Spaces: Provide initiating devices and elevator controls interface to comply with NFPA 72 and ANSI A17.1 elevator code requirements for elevator recall and shutdown.
  - 1. Coordinate initiating device temperature ratings, sensitivity settings, and location with sprinkler rating and location. Select temperature rating nominal 10 degrees F less than the adjacent fire sprinkler.
  - 2. Ensure device operating ranges for temperature and humidity are suitable for installed environment. Do not install smoke detectors in unsprinklered elevator hoistway unless required otherwise by AHJ.
  
- O. Addressable Interface Devices:
  - 1. Addressable interface and control modules (used to monitor all contact type initiating devices) must be in a conditioned space, unless they are tested, listed, and marked for continuous duty across the range of temperatures and humidity expected at their installed location.
  - 2. Sprinkler system supervisory circuits for monitoring valve position, air pressure, water temperature, pump status, etc., must cause distinct audible and visible indications at the FACP.
  - 3. Install interface devices used to initiate emergency control functions no more than 36 inches from the component controlling the emergency control function.
  
- P. Isolation Modules: Provide in the following locations to minimize the impact of wiring faults:
  - 1. After each 50 initiating devices and control points on the addressable loop, or a lesser number where recommended by the manufacturer.
  - 2. Near the point any addressable circuit extends outside the building, except for those attached to the building exterior walls and well sheltered by walkways.
  - 3. For loops covering more than one floor, install isolator at terminal cabinet on each floor with additional isolator[s] on any floor with over 50 addresses.
  - 4. Each isolation module must be clearly labeled, readily accessible for convenient inspection (not above a lay-in ceiling).
  
- Q. Independent fire-suppression/extinguishing systems
  - 1. Provide interface modules and all control unit connections required to supervise fire-suppression and extinguishing system indicated on drawings.

### 3.3 PATHWAYS AND CONDUCTORS

- A. Wiring Methods: Install all fire alarm wiring in metal conduit, minimum 3/4-inch, in accordance with Section 260533, "Raceways and Boxes for Electrical Systems" and manufacturer's recommendations. Conceal raceway, except in unfinished spaces.
  - 1. Unenclosed wiring methods may be used in accessible ceiling spaces.
  - 2. Install plenum rated cable in environmental air spaces, including plenum ceilings.
  
- B. Provide red finish for fire alarm raceways in assessable areas above ceilings, and exposed unfinished spaces. Match adjacent architectural finish for exposed fire alarm raceways in finished areas with red junction box covers.
  
- C. All junction box covers shall be painted red on both sides to designate use for Fire Alarm conductors. The interior of junction boxes shall not be painted.
  
- D. Where allowed, surface boxes shall be as manufactured by the device manufacturer for the installed device and shall match devices in size.

- E. There shall be no splices in the system other than at device terminal blocks, or on terminal blocks in cabinets. "Wire nuts" and crimp splices will not be permitted. All terminal block screws shall have pressure wire connectors of the self-lifting or box lug type.
- F. For underground raceways and other wet locations, provide moisture resistant PLTC cable.
- G. All fire alarm and communications circuits that are run underground or beyond the building footprint shall be provided with a surge protective device at both ends of the circuit.
- H. All circuits leaving the riser on each floor or building zone shall feed through a labeled terminal block in a terminal cabinet accessible from the floor.
- I. T-Taps are not permitted for Class B circuits. Locate end of branch devices in a readily accessible location.
- J. For fire alarm devices in exterior locations, connect raceways to the back or bottom of the device box in a manner that prevents moisture intrusion and build-up.

### 3.4 CONNECTIONS

- A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions. Connect hardware and devices to fire-alarm system.
  - 1. Verify that hardware and devices are listed for use with installed fire-alarm system before making connections.
- B. Coordinate connections to electronic access-controlled doors with door hardware specifications and actual door hardware. Provide all connections for release of locking mechanisms in egress paths as required.
- C. Verify exact connection requirements to all equipment and devices of other trades with those trades prior to ordering equipment.
- D. Make addressable connections with a supervised interface device to controlled or monitored devices and systems. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

### 3.5 IDENTIFICATION

- A. Comply with Section 270553, "Identification for Communications Systems"
  - 1. Identify system components, wiring, cabling, and terminals. Identify all fire alarm circuits at terminal and junction locations.
  - 2. Install a nameplate on each fire alarm panel and power supply to indicate the equipment designation, panelboard and circuit number supplying the fire alarm equipment.
  - 3. Branch circuit overcurrent protective devices powering fire alarm equipment shall be identified as FIRE ALARM CIRCUIT with a red and white engraved label permanently affixed to the equipment.
  - 4. Provide engraved label for each remote alarm indicator.
  - 5. Label all addressable control modules to identify their function.
- B. Basic operating instructions shall be framed and permanently mounted at the FACP. (If the owner concurs, they may instead be affixed to the inside of the FACP's door.) In addition, the

NFPA 72 "Record of Completion" must either be kept at the FACP, or its location shall be permanently indicated there by an engraved label. All System documentation shall be provided and housed in a Documentation Cabinet at the control panel or other approved location in accordance with NFPA 72.

### 3.6 GROUNDING

- A. Ground FACP and surge protective devices for associated circuits.
- B. Ground shielded cables at control panel location only. Insulate shield at device location.

### 3.7 FIELD QUALITY CONTROL

- A. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
- B. Coordinate all testing in occupied buildings with the owner's representative to minimize the disturbance to the building occupants.
- C. Visual Inspections: Conduct prior to testing.
  - 1. Inspection must be based on completed record Drawings and system documentation that is required by "Completion Documents, Preparation" table in "Documentation" section of "Fundamentals" chapter in NFPA 72.
  - 2. Comply with "Visual Inspection Frequencies" table in "Inspection" section of "Inspection, Testing and Maintenance" chapter in NFPA 72; retain "Initial/Reacceptance" column and list only installed components.
- D. Preliminary Testing
  - 1. Check all wiring for grounds, opens, and shorts, prior to termination at panels and installation of detector heads. The minimum resistance to ground or between any two conductors shall be 10 megohms, as verified with an insulation tester.
  - 2. Ensure all devices and circuits are functioning properly in accordance with manufacturer's requirements.
- E. System Acceptance Testing: Comply with "Test Methods" table in "Testing" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.
  - 1. Test audible appliances for public operating mode in accordance with manufacturer's written instructions. Perform test using portable sound-level meter complying with Type 2 requirements in ASA S1.4 Part 1/IEC 61672-1.
  - 2. Verify candela settings and test visible appliances for public operating mode in accordance with manufacturer's written instructions.
  - 3. Test all site-specific software functions and provide a detailed report showing the system's operational matrix. Each initiating device shall activate the proper response and system notification.
  - 4. Verify all other system functions, including (where applicable) elevator capture and the control of HVAC systems, door locks, pressurization fans, fire or smoke doors/dampers/shutters, etc.
  - 5. Verify digital communicators are on-line and tested for proper communication to the receiving station.
  - 6. All supervised circuits must also be tested to verify proper supervision.

7. Verify the voltage drop of each NAC circuit by testing and recording the voltage at the origin and at the EOL for each NAC circuit, under battery power only.
- F. Reacceptance Testing: Perform reacceptance testing to verify proper operation of added or replaced devices and appliances, software modification, or wiring modifications. Such re-testing shall be included as part of the base bid and provided at no additional cost to the Owner.
- G. Final Acceptance Test: Complete record drawings and system operation matrix are required prior to scheduling final acceptance test.
  1. The owner's representative, monitoring service, and fire department shall be notified before final tests in accordance with local requirements.
  2. Operate every device to verify proper operation and correct annunciation.
  3. Open signaling line circuits and notification appliance circuits in at least two locations to verify proper supervision.
- H. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- I. Factory-authorized service representative must prepare "Fire Alarm System Record of Completion" in "Documentation" section of "Fundamentals" chapter in NFPA 72 and "Inspection and Testing Form" in "Records" section of "Inspection, Testing and Maintenance" chapter in NFPA 72. Submit certified results to the AHJ, Owner, Architect, and Engineer.
- J. Prepare test and inspection reports.

### 3.8 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.
- B. The manufacturer's authorized representative must instruct the owner's designated employees in operation of the system, and in all required periodic maintenance. A minimum of 8 hours on-site time will be allocated for this purpose. Two copies of a written, bound summary will be provided, for future reference.
- C. Training shall cover as minimum the following topics:
  1. Preventive maintenance service techniques and schedules, including historical data trending of alarm and trouble records.
  2. Overall system concepts, capabilities, and functions. Training shall be in depth, so that the owner shall be able to take any device out of service and return any device to service without need of Manufacturer's approval or assistance.
  3. Explanation of all control functions, including training to program and operate the system software.
  4. Methods and means of troubleshooting and replacement of all field wiring devices.
  5. Methods and procedures for troubleshooting the main fire alarm control panel, including field peripheral devices as to programming, bussing systems, internal panel and unit wiring, circuitry, and interconnections.
  6. Manuals, drawings, and technical documentation. Actual system software used for training shall be provided in digital form and shall be left with the Owner at the completion of training for the Owner's use in the future.

- D. A receipt shall be obtained from the Owner that this has been accomplished, and a copy included in the close-out documents.

**END OF ADDRESSABLE FIRE ALARM SYSTEMS**